





国家工业和信息化部消费品工业司 中国化学纤维工业协会 东华大学 中国棉纺织行业协会



# 创新多维技术

· 盛虹科技 · 国望高科 · 中鲈科技 · 港虹纤维



## "全球差别化纤维专家"

全球领先的全消光系列纤维生产线 全球领先的阳离子DTY系列纤维供应商 全球领先的细旦差别化供应商 全球领先的PTT切片生产商之一 拥有完整的生物质合成高分子纤维产业链







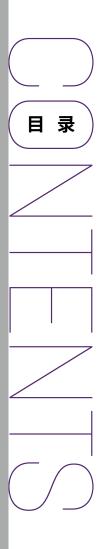
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# Fiber, the Guide of Creation and Future

# 纤引创生 维领未来

中国纤维发展面临着诸多机遇和挑战,新一次的科技革命值得高度关注。

新一次的科技革命以纳米科学和纳米技术、生命科学和生物技术、信息科学和信息技术以及认知科学的交互作用和深度融合为特征,将形成资源和能源节约型、绿色低碳的崭新的经济形态。在相当的发展周期内,成为引领人类文明进步的主导力量,是人类社会从工业文明向生态文明过渡的决定性力量。新一次的科技革命蕴含着许多创新机会,包括互联网+、物联网、移动无线网、大数据、云计算、人工智能、量子通信等在内的新一代信息技术,以及信息技术在经济和社会领域的渗透和应用,譬如智能化和绿色化的先进制造、机器人、智能交通、智能电网、可再生能源、绿色技术等。

纤维新材料是基于材料、化学、信息、机械、生物等学科领域的技术突破与交叉融合,强调功能创新、强化与复合,具有轻质、多功能、智能、择优取向等特性;更有超高性能、高性价比、高附加值、高产业拉动效应以及低碳绿色等优异特性;能够对传统产业起到高渗透性、颠覆性、革命性提升效果的新一代一维线性材料;是舒适健康、安全防护、智能与功能消费品及航天航空、环保与防护、现代建筑业与农业、生物医用等领域的关键基础材料和核心材料。



The development of Chinese fiber is faced with a myriad of opportunities and challenges, and high attention should be paid to a new scitech revolution.

As the new sci-tech revolution features interaction and deep integration of nanoscience and nanotechnology, life science and biotechnology, information science and information technology, and cognitive science, a brand-new economic pattern of resource and energy conservation as well as green and lowcarbon development will take shape, which will, within a considerable development period, become the leading force for the progress in human civilization, and the decisive force for achieving transition of the human society to ecological civilization from industrial civilization. The new sci-tech revolution ushers in numerous innovation opportunities including new information technologies such as Internet Plus, Internet of Things, mobile wireless network, big data, cloud computing, artificial intelligence and quantum communication, as well as penetration and application of information technology in the economic and social fields, such as intelligent and green advanced manufacturing, robots, intelligent transportation, smart power grids, renewable energy source and green technology.

Based on technological breakthrough and cross integration of material science, chemistry, information, machinery, biology and other disciplines, new fiber materials focus on function innovation, reinforcement and compounding, and feature light weight, multifunctionality, intelligence, preferred orientation and the like. Moreover, they have outstanding advantages of ultrahigh performance, high cost performance, a high added value, a high industry pulling effect, low carbon, environmental protection and the like. They are a new generation of onedimensional linear materials that can achieve the effect of revolutionarily elevating the traditional industry with high market penetration and innovation. They are also key basic materials and core materials in the fields of healthy and comfortable life, safety protection, intelligence and functional consumer goods, aerospace, environmental protection, modern building, agriculture, biomedicine and so on.



回顾历次世界科技革命,它们无不改变了人类文明进程,促进了人类文化进步。 以"珍妮纺织机"为代表的第一次科技革命(蒸汽技术革命),以工厂代替了手工工场,用机器代替了手工劳动。由"蒸汽时代"进入"电气时代"的第二次科技革命(电力技术革命),创生了化学工业,化学产品,塑料、绝缘物质、人造纤维也相继发明并投入了生产和使用。以原子能技术、航天技术、电子计算机技术的应用以及人工合成材料为代表的第三次科技革命(信息控制技术革命),让人类社会日益欣欣向荣。

当中国纤维新材料遇见新一次科技革命,将带来社会经济、人民生活全方位多维度全新变革——从"霓裳羽衣"到"医卫环保国之重器"的应用领域的拓展;从"衣被天下"到崇尚"健康生活品格人生"的消费观念的改变;从"资源消耗"到"人与自然和谐共生"的产业绿色发展理念的革新;从"线下"到"线上"的资源整合效能的提升;从"自动化"到"智能化数字化"的制造系统的飞跃。中国纤维向创生出发,中国纤维向未来启航。

勇立科技革命潮头,只争朝夕不负韶华,是中国纤维产业面向未来必须抓住的重大战略机遇,是中国纤维人秉承家国情怀助力纤维强国梦顺利实现的历史使命。中国纤维产业,中国纤维人已准备好,吹响科技革命号角,迎接崭新时代到来。新的科技革命在中国纤维行业悄然萌发,我们看到——



In retrospect, all the world's sci-tech revolutions have changed the course of human civilization and promoted the progress in human culture. The first sci-tech revolution (Steam Technology Revolution), represented by 'Jenny textile machine', replaced manual workshops with factories, and manual labor with machines. As the second sci-tech revolution (Power Technology Revolution) from the 'Age of Steam' to the 'Age of Electricity' created the chemical industry, chemical products, plastics, insulating substances, and artificial fiber were invented one after another and put into production and use. The third sci-tech revolution (Information Control Technology Revolution) represented by the atom energy technology, space technology, electronic computer technology and artificial synthetic materials brought an increasingly prosperous human society.

The encounter of the Chinese new fiber materials with the new sci-tech revolution will bring an all-around multidimensional brand-new revolution to the social economy and people's life, including the expansion of the application fields from 'raiment' to 'a pillar of the nation for medical health and environmental protection', the change of the consumption concept from 'comfortable clothes with protection against cold' to 'healthy lifestyle and quality life', the innovation of the industry green development idea from 'resource consumption' to 'harmonious co-existence between human and nature', the improvement of resource integration efficiency from 'offline operation' to 'online operation', and the leap of the manufacturing system from 'automation' to 'intellectualization and digitization'. Chinese fiber starts from creation and sets sails for the future.

Bravely standing at the wave crest of the sci-tech revolution, seizing the day and living to the full has become the major strategic opportunity for the Chinese fiber industry to seize in the future to come and a historical mission for Chinese people to assist in successfully realizing the dream of building a prosperous country with fiber out of a sense of patriotism. The Chinese fiber industry and its people are ready to play the horn of the sci-tech revolution and greet the arrival of a new era. The new sci-tech revolution has sprouted quietly in the Chinese fiber industry, as we can see.



#### 纤维行业新技术若春水初生

产品创制层面:在追求健康、舒适的今天,打破化学纤维与天然纤维之间的界限,新型纺纱技术结合新型纤维,赋予新纱线抑菌、抗紫外、吸湿速干、保暖、阻燃、防静电等功能,为纱线设计带来了新的思路。强捻、后道加弹等工艺的优化,助力纱线品质不断升级,特色工艺结合时尚,纱线品种推陈出新。

以纤维材料为基础,具备多材料、多结构、多功能、超性能和绿色化等特点,能够感知、计算、储能、通信、执行的新型基础材料,悄然出现。新一代纤维和纺织产品超越穿戴和美感的传统概念,在力、热、电等方面拥有不同以往的高性能,并集成数据传输、能量存储、环境响应、柔性传感等全新应用,未来智能穿戴将全方位融入人们日常生活。借助纳米技术、碳纳米管、石墨烯、3D 打印、工业生物、仿生传感等前沿新技术的丰富灵感和奇思妙想,纤维产业变革加速演进,新型纤维的概念和设计将触角蔓延至人类生活的方方面面。

产品应用层面:纤维以健康舒适、安全防护、结构增强终端需求为目标,通过科学、技术的创新,让纤维自创生之初就拥有抗紫外、抗辐射、导电、抑菌、吸湿、导热、环境响应等复合功能,满足国人服饰从家居审美到由内而外的安全保障的需求。

# New technologies of the fiber industry emerge like initial flow of spring water

Product creation level: In the era of pursuit of health and comfort, breaking the boundary between the chemical fiber and natural fiber, and combining the novel spinning technology with new fiber endow new yarn with the functions of bacterial resistance, ultraviolet resistance, moisture absorption and quick drying, heat reservation, flame retardance, static electricity resistance and the like, and also bring a new idea for yarn design. The optimization of heavy twisting, post-stage elasticizing and other processes assists in achieving constant upgrading of yarn quality, and with the combination of characteristic processes with fashion, innovation is made in yarn varieties.

Based on fiber materials, new basic materials have quietly come out, featuring multiple materials, multiple structures, multiple functions, super performance and environmental protection performance, as well as the capabilities of sensing, calculation, energy storage, communication and execution. The new generation of fiber and textile products have transcended traditional ideas of wearability and aesthetics, featuring high performance in the aspects of force, heat, electricity and the like different from the past, and integrating data transmission, energy storage, environmental response, flexible sensing and other brand-new application. In the future, intelligent wearing will be merged in people's daily life in an all-around way. By virtue of rich inspiration and wonderful thinking in nanotechnology, carbon nano tubes, graphene, 3D printing, industrial biology, bionic sensing and other new leading technologies, the revolution of the fiber industry is accelerated, and the concept and design of the new fiber will spread to every aspect of human life.

Product application level: With the goals of health and comfort, safety protection and terminal demand for structure enhancement, innovation is made in science and technology, so that the fiber is endowed with the compound functions of ultraviolet resistance, radiation resistance, electricity conduction, bacteria resistance, moisture absorption, heat conduction, environmental response and so on since its creation to meet the demands of domestic people for costumes from home aesthetics to safety guarantee from the inside out.

The large-scale creation of high-quality melt-blown PP non-woven fabric, plasma electret polypropylene materials, the electret dispersing and spinning technology and medical micro-nano fiber with compound function provides assistance from individual protection by means of masks, protective garments and the like to the guarantee of health of the front of medical and health care, and helps Chinese people to fight against the epidemic and regain a safe and sound country when the spring comes. Bio-based fiber, hollow fiber separation membranes, intelligent fiber for sensing and detecting and other high-tech fiber show extraordinary functions in the high-end medical fields of absorbable sutures, medical dressing, carriers for drug control release, bone repairing materials, artificial organs and the like, offering a shield for health.



高质量熔喷 PP 无纺布、等离子驻极聚丙烯材料,驻极剂分散及纺丝技术、复合功能 医用微纳米纤维规模化创制,助力从口罩、防护服等个体防护到医疗卫生一线保障。助力中国人民战"疫",春暖花开时,山河定无恙。生物基纤维、中空纤维分离膜、传感探测用 智能纤维等高新技术纤维在可吸收缝合线、医用敷料、药物控释载体、骨骼修复材料、人工器官等在高端医疗领域大放异彩,撑起"健康之伞"。

大力推动高温烟气过滤用纤维、纤维膜过滤材料、土工用纤维材料等环境保护用纤维研发,保持水土生态,减少大气污染,营造一份心旷神怡安然之境。挑战加工极限,高性能纤维以"岿然"之势助力与终端精准对接,高强高模、耐高温、抗腐蚀等超能力为产品开发提供"支撑实力",在风电发电、土木建筑、国防军工、航空航天等极端应用领域中体现卓越价值,撑起"国之重器"。

制造技术层面: 生物转换技术、发酵技术、循环再利用技术的应用,让纤维可以从摇篮到摇篮,形成碳的闭合循环,支撑纤维产业绿色低碳和循环经济发展。人工智能、大数据、云计算、边缘计算、机器视觉等新兴技术将与纤维交融渗透,新一代信息通信技术与人工智能技术通过工业互联网"端—边—云"协同计算模式,有机融入行业核心装备及产线,精准实现客户定制化的需求,推动纤维行业的智能化升级。

新一代纤维材料将对传统纺纱织造工艺、装备提出了新的革新要求,同时,以建模仿真、 立体编织和 3D 打印为代表的数字制造和增材制造等新型制造技术的应用,从后端应用反 馈新型纤维材料的性能需求。纺织产业链以前所未有的速度深度融合。

With the goal of preserving ecology of water and soil, reducing atmospheric pollution and creating a relaxing and comfortable environment, the research and development of fiber for hightemperature smoke filtration, materials for fibrous membrane filtration, geotechnical fibrous materials and other fiber for environmental protection are further promoted. Challenging the processing limit, the high-performance fiber is steadily and precisely matched with terminals, props up product development with its high strength, high modulus, high temperature resistance, corrosion resistance and other super power, and embodies superior value in wind power generation, civil construction, national defense and military industry, aerospace and other extreme application fields, giving full play to the role of 'a pillar of the nation'.

Manufacturing technology level: Application of the bio-transformation technology, fermentation technology and recycling technology achieves closed cradle-to-cradle carbon cycling for fiber, and sustains the fiber industry to develop towards greening, low carbon and circular economy. Artificial intelligence, big data, cloud computing, edge computing, machine vision and other emerging technologies will be mingled and blended with fiber. The new generation of information communication technology and artificial intelligence technology are organically integrated into the core industry equipment and production line by means of the 'end-side-cloud' collaborative computing mode of the Industrial Internet, so that the customized demands of customers are precisely met, and intelligent upgrading of the fiber industry is propelled.

The new generation of fiber material will present new renovation requirements for

the traditional textile spinning and weaving process and equipment. In the meanwhile, the application of digital manufacturing, additive manufacturing and other new manufacturing technologies represented by modelling and simulation, stereoscopic weaving and 3D printing feed the performance requirements of new fiber materials back from the back end. The textile industry chains are being deeply integrated at an unprecedented speed.

# New fiber industry germinates like plants in spring

Integrated application of the blockchain technology plays an important role in new technological innovation and industry transformation. In the textile industry, the blockchain technology can run through the whole life cycle of products and achieves the functions of enhancing the transparency and traceability of the value chain of the textile and garment and improving the credibility and brand recognition of the products. The blockchain technology is expected to become one of basic technologies of the new sci-tech innovation, and the organic integration of the blockchain technology, big data, cloud computing and artificial intelligence will greatly improve the running efficiency of real economy and boost the transformation and upgrading of manufacturing. Through the collaborative innovation of the industry chains, the separated industry is transformed into the system layout achieving upward raw material integration, and downward quick response of designing and manufacturing, fiber factories are furthermore transparent and modularized, and the new fiber industry form developing with the trend of 'B2C' and 'block orientation' will fuel terminal consumption.

#### 纤维产业新业态似百草权舆

区块链技术的集成应用在新的技术革新和产业变革中起着重要作用。在纺织产业中,区块链技术可贯穿产品的整个生命周期,增强纺织服装价值链的透明度和可追溯性,提高产品的可信度以及品牌度。区块链技术有望成为新一次科技革命的基础技术之一,与大数据、云计算、人工智能有机融合,将极大提升实体经济的运行效率,推进制造业的转型升级。产业链协同创新将分离式的产业打造成向上原料整合,向下设计制造快速响应的系统布局,纤维工厂进一步透明化、模块化,"B2C"和"区块化"趋势的新纤维产业业态将拉动终端消费。



#### 纤维企业新模式如星星之火

创新与资本融合的新型商业模式,推动行业资源优化与要素整合,形成创新性、包容性发展新型商业模式。集成创新平台,支撑快速响应体系。

先进功能纤维创新中心作为国家级创新平台,承载国家使命,不忘初心,坚持需求导向,聚焦功能纤维新材料、高端用纤维材料及纺织品、前沿纤维新材料等重点领域的关键共性 技术,推进科技成果转化,不断提升科技、系统工程、服务、品牌的创新,促进行业技术进步, 带动产业生态形成,进一步打造核心竞争力的飞跃。

中国纤维奋楫争先,创立创新平台体系,利用智能、绿色、柔性制造叠加效应优势,全方位鼓励产业与资本结合、制造装备与国际对接,打造从引领到全局掌握的中国模式,进一步实现行业发展模式的飞越。

"创新驱动的科技产业、文化引领的时尚产业、责任导向的绿色产业"已成为我国纺织行业推进高质量发展的新定位和战略重心。新一次的科技革命引导人类社会从工业文明向生态文明过渡。未来已来,站在时代前沿,面向多元化的未来,中国纤维以科技创新为驱动,绿色发展为本心,为了壮美中国,为了大美人间。

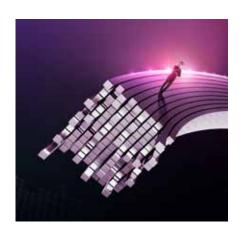
2020年是"十三五"规划收官之年,是全面建成小康社会的决定性一年,新的时代已经来临,新的征程正要开启,新的篇章必将挥就,站在时代的前沿,中国纤维人将勇立潮头、百舸争流、只争朝夕,尽显中国纤维奋进本色,奏响时代强音。

## New model of fiber enterprise develops like prairie fire

The novel business model integrating innovation and capital drives optimization of industry resources and integration of elements, reaches innovativeness and inclusive development, integrates the innovation platform, and holds up the quick response system.

As the national-level innovation platform, the Advanced Functional Fiber Innovation Center carries the national mission, remains true to the original aspiration, insists on demand orientation, focuses on key generic technologies of new functional fiber materials, high-end fiber materials and textiles, cutting-edge new fiber materials and other key fields, propels the transformation of sci-tech achievements, and continuously advances innovation of the technology, system engineering, services and brands, so that technological advancement of the industry is promoted, the industrial ecology is driven to take shape, and the leap of core competitiveness is furthermore forged.

The Chinese fiber industry strives to take the lead in setting up the innovation platform system, and comprehensively encourages combination of the industry and capital and connection of manufacturing equipment and international equipment by utilizing advantages of superimposed effects of intelligence, greenness and flexible manufacturing, so that a Chinese model that plays the role of guiding and overall mastering is built, and the advancement of the industry development model is furthermore achieved.



The ideas of 'innovation-driven sci-tech industry, culture-guided fashion industry and obligation-guided green industry' have become the new positioning and strategic center for boosting high-quality development of China's textile industry. The new sci-tech revolution is guiding the transition of human society from industrial civilization to ecological civilization. Orienting toward the future, Chinese fiber is driven by sci-tech innovation with green development as its core to strive for a stronger and grander China and a more beautiful world.

2020 is the ending year of the Thirteenth Five-Year Plan and a decisive year to achieve the goal of building a moderately prosperous society in all aspects. The new era has come, the new journey is about to set up, and a new chapter will certainly be written. Standing at the leading position of the era, Chinese people will forge ahead, work tirelessly and seize every moment to demonstrate extraordinary splendor and strength Chinese fiber.





### 守正

中国纤维,波澜壮阔,从弱小到强大、从稚嫩到成熟的空前飞越,蕴含着一代又一代纤维人披荆斩棘的探索实践与砥砺奋进的不懈拼搏。中国纤维,漫卷舒云,从美化人民生活、引领消费、创造需求,到建设生态文明、增强文化自信、促进社会和谐,勇立潮头,敢为人先、沉稳前行。

**守发展之正,奉献社会,经纬天下。**纤维人栉风沐雨,从技术装备引进吸收到自主创新成就纤维大国,将我国纤维打造成世界最完整的产业体系。 纤维企业不断探索发展,结合数字化、柔性化、智能化、绿色制造,融合高分子材料、生物工程、微电子等前沿技术,致力纤维强国梦。

**守理念之正,承担责任,勇于担当。**纤维人兼容并蓄,将巧思创意融入 到一经一纬中,倾力打造中国质造,以质为先。纤维企业迸发内生动力,从 资源环境消耗的中低端制造业开启全产业链的价值提升,打造绿色环保、低 碳责任的时尚科技产业,致力于劳动者、资源环境、社会的和谐永续发展。

**守道路之正,坚守初心,砥砺前行。**纤维人守正出新,不断焕发新的活力与生命力,聚焦新科技、新服务、新转变,构建发展新路径。纤维企业升级生产制造新模式,利用纤维应用技术创新解决与支撑社会发展问题,将行业发展融入新时代社会经济文明发展的新征程。

# **Integrity**

The Chinese fiber industry has experienced a magnificent upsurge, evolved from weak to strong, and unprecedentedly leaped from immature to mature, containing the exploration, practice and relentless struggle of generations of Chinese people through removing obstacles and overcoming difficulties on the way forward. With years passing by, starting from beautifying people's lives, guiding consumption and creating demand, to building ecological civilization, strengthening confidence in Chinese culture and promoting social harmony, Chinese fiber has bravely set the trend of being the first and making steady progress.

**Upholding the integrity in development, dedicating to society as well as making contributions to the mankind.** From the introduction of technology and equipment to the achievement of fiber power through independent innovation, Chinese fiber has become the most complete industrial system in the world with unremitting struggle of Chinese people. By constantly exploring development, fiber enterprises are committed to turning China into a great power in fiber by combining digitization, flexibility, smart technologies and green manufacturing, and integrating cutting-edge technologies such as high polymer materials, bioengineering and microelectronics.

**Upholding the correct concept and taking up great responsibility.** Chinese people are all-inclusive and tend to incorporate creative ideas into each step of their cause, aiming to build high-quality Chinese products and bear quality as their first stand. Fiber enterprises have an endogenous drive to improve the value of the entire industrial chain from the middle– and lowend manufacturing industries that consume resources and the environment, and to create a green, low-carbon and responsible fashion technology industry, committing to the harmonious and sustainable development of workers, resources, the environment and society.

**Keeping the right way, sticking to the original intention and forging ahead.** Chinese people in the fiber industry are creating new technologies while keeping integrity, constantly displaying new energy and vitality, focusing on new technology, new services and new changes, and building a new path of development. The fiber enterprises have upgraded the new mode of production and manufacturing, addressed and supported social development through the innovation of fiber application technology, and incorporated the development of the fiber industry into the new era of social, economic and civilized development.

# 鼎新

40年砥砺奋进,中国纤维将自身建设融入到波澜壮阔的国家和民族事业中,从时尚服饰、高端家纺,到医疗防护、助力导弹飞天,"鼎天立地"撑起国之重器。中国纤维通过科技、产业、模式的鼎力创新,带动消费理念升级,促进产业颠覆性、革命性提升,在产业的飞腾中书写精彩篇章。

**鼎科技之新,注重原创,突破瓶颈。**借助纳米、碳纳米管、石墨烯、气凝胶、3D 打印、工业生物、分子设计、仿生传感等前沿新技术,采用化学纤维和天然纤维混纺技术、新型纺纱技术、特色工艺叠加时尚元素,纤维产业技术变革加速演进,不断涌现的新型材料的触角将蔓延至人类生活的全部。

**鼎产业之新,开放融合,系统集成。**主动对接互联网+、物联网、大数据、云计算、人工智能、5G、仿真等领域创新成果,让纤维生产、营销、物流更加网络化、智慧化、生态化,开启智能制造、绿色制造,打造制造业与服务型融合、低碳经济发展的典范。

**鼎模式之新,上下联动,专业细分。**以关键要素与核心产品主导的制造企业,成为专业化细分的引领者。纤维产业链协同创新将分离式的产业打造成向上原料整合,向下设计制造快速响应的系统,工厂进一步透明化、模块化,以"B2C"和"区块化"为趋势的新产业模式成为资本追捧的新宠。

### **Innovation**

After 40 years of hard work, the Chinese fiber industry has integrated its construction into the magnificent national and ethnic undertakings, such as fashion apparel, high-end home textiles, medical protection and support for missile launching, giving full play to the role of 'a pillar of the nation'. Chinese fiber has driven the upgrading of consumption concept and promoted the subversion and revolution of the industry through the innovation of science and technology, industry and mode, writing a wonderful chapter in the development of the industry.

**Innovating in science and technology, focusing on originality and breaking through bottleneck.** The fiber industry has accelerated the technological evolution and the constantly emerging new materials will spread to every corner of human life with cutting-edge new technologies such as nanotechnology, carbon nanotubes, graphene, aerogel, 3D printing, industrial biology, molecular design and bionic sensing, the blending technology for chemical fiber and natural fiber, new spinning technology and combination of special process and fashion elements.

**Upholding industry innovation, opening and integration and system integration.** Efforts are made to take the initiative to bring in innovative achievements in the fields of Internet Plus, Internet of Things, big data, cloud computing, artificial intelligence, 5G, simulation, etc., so that fiber production, marketing and logistics can be more networked, intelligent and ecological, intelligent and green manufacturing can start, and a model of the integration of manufacturing and services and the development of a low-carbon economy can be built.

#### Upholding pattern innovation, coordination and professional segmentation.

Manufacturing enterprises with key elements and core products as the core become the leader of professional segmentation. Collaborative innovation in the fiber industry chain has transformed the separated industry into a fast-response system with upward integration of raw materials and downward design and manufacture. The factories become more transparent and modularized, and the new industrial model with the trend of 'B2C' and 'block orientation' has become the new favorite for the pursuit of capital investment.

### 性能图标

#### Performance Icon



易上染

Easy-dyable



弹性持久

Durable Elastic



#### 易打理

Ease-care



#### 柔软

Soft



#### 吸湿速干

Fast Dying



抗起球

Anti-pill



透气

Breathable



绿色环保

Green & Environmental Protection



#### 分散性好

Dispersion



#### 婴儿级纺织品

infant textile products



#### 耐腐蚀

corrosion resistance



#### 抗静电

Anti-static



#### 隔热

Heat Insulation



#### 色彩持久

Durable Color



#### 阻燃

Flame Retardant



#### 抑菌

Anti-bacteria



#### 耐高温

Heat-resistant



#### 抗皱

Anti-wrinkle



#### 耐老化

Anti-aging



#### 无重金属析出

No Heavy Metal



#### 挺括

Structured



#### 防透视

Anti-perspective



#### 纺前着色

Dope dyed



#### 远红外

Far infrared



#### 电绝缘

Electric insulation



#### 耐化学药品

Chemical resistance



#### 温度调节

Warmth & Cooling



#### 防紫外线

Anti-UV



#### 易加工

Easy Processability



#### 部分替代原生纤维

Virgin Fiber Replacement



#### 高耐(电)压

High (Electricity) Pressure Resistant



#### 生物降解

Biodegradability



#### 仿真丝

High imitation silk



#### 高强度

High-strength



#### 色彩丰富

Enriched colors



#### 悬垂性好

Good Drapability



#### 生物质

Biomass



#### 循环再生

Recycling & Regeneration



#### 均匀稳定

Good Stability



#### 抗拉强度高

High Tensile Strength



#### 耐酸碱

Acid & Alkali Endurance



#### 抗蠕变

Creep Resistance



#### 无毒

Non-toxic



#### 低烟

Low toxicity



#### 高模量

High Modulus



#### 亲肤

Skin Friendliness



#### 染色鲜艳

Durable Color



#### 吸收光源

Absorption from light sourcet



#### 保暖

Heat Preservation



#### 吸湿发热

Absorbing Moisture and Emitting Heat



#### 异形截面

Specially Shaped Section



#### 耐磨

Wear Resistance



#### 效率高

High productive efficiency



#### 强辐射

Anti-drip



#### 单丝纤度

Fineness monofilament



#### 耐高低温

High and Low Temperature Resistant



#### 低模量

Low Modulus



#### 高伸长

High Stretch



#### 低应力

Low Stress



#### 质量轻

Lightweight



#### 防泼水

Water-repellent



#### 凉感

Cool feeling



#### 除臭

Deodorizing function



#### 驱蚊

Mosquito repellent



#### 抗熔滴

Anti-drip



#### 光泽好

Good luster

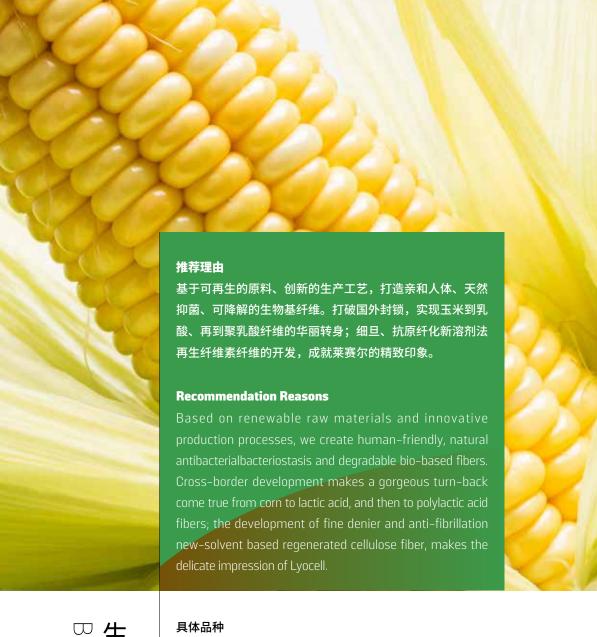


# Green Move

破茧涅槃,极致绽放。采用"绿色"原料——实现从玉米到聚乳酸纤维的华丽转身,细旦、交联新溶剂法再生纤维素纤维成就莱赛尔精致印象;研发"绿色"技术——赋予纤维质本菁彩,减少染整能耗排放,助力低碳环保;创造"绿色"循环工艺——从物理法迈向化学法,从聚酯不断延伸到其他品种,品质媲美原生。绿色纤维将可持续发展发挥到极致,实现资源循环与环境保护。

The fiber industry has played through the pain and gained new vitality. 'Green' raw materials are used to achieve the gorgeous transformation from corn to polylactic acid fiber, and fine denier and new solvent based regenerated crosslinked cellulose fiber has created the delicate impression of Lyocell. The R&D of the 'green' technology has endowed fiber with natural charming, reduced dyeing and finishing energy use and emissions, and supported low–carbon environmental protection; The 'green' circular process created with chemical method instead of physical method is constantly extending from polyester to other varieties, and its quality is on a par with native quality. Green fiber brings sustainable development into full play and realizes resource recycling and environmental protection.

FIBER



# **Specific Variety**

#### • 聚乳酸纤维

Polylactic Acid Fiber

#### • 细旦新溶剂法再生纤维素纤维

New-solvent Based Regenerated Fine Denier Cellulose Fiber

#### • 交联型新溶剂法再生纤维素纤维

New-solvent Based Regenerated Crosslinked Cellulose Fiber

#### 聚乳酸纤维

# Polylactic Acid Fiber



#### 制备技术 Processing Technology

将玉米、木薯、红薯、甜高粱等农作物分解提取出淀粉,再利用酶转化成葡萄糖;或将秸秆分解提取出纤维素和半纤维素,再通过物理和化学方法转化成葡萄糖。葡萄糖经过发酵生成乳酸,乳酸通过浓缩制得丙交酯,再经开环聚合生成聚乳酸,经熔融纺丝工艺制得聚乳酸纤维。

Starch is obtained from the decomposition of Corn, cassava, sweet potato, sweet sorghum and other crops. which is then converted into glucose using enzymes; or straw is decomposed to extract cellulose and hemicellulose, which is then converted into glucose by physical and chemical methods. Glucose is fermented to produce lactic acid; lactic acid is concentrated to produce lactide; and then polylactic acid is produced through ring-opening polymerization, and polylactic acid fibers are produced through the melt spinning process.



流程示意图 Flow Chart of Preparation

#### 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

短纤 Staple fiber 1.33~6.66dtex × 38~51mm 中空和实芯 Hollow and solid core 长丝 Filament yarns 83.33~166.67dtex/72~144F

#### 标准及认证 Standards and Certifications

《聚乳酸短纤维》Polylactic acid staple fiber (FZ/T 52041-2015) 《聚乳酸牵伸丝》Polylactic acid drawn yarn (FZ/T 54098-2017) 《一种聚乳酸短纤维的制备方法》 Preparation method of polylactic acid staple fiber (ZL201811076224.5)

#### 纤维性能与制品特点 Fiber Performance and Product Features

• 生物基原料,绿色环保 Bio-based materials, and products can be degraded



Antibacterial, anti-mite, anti-allergy ・亲肤、保暖、透气

• 抑菌、抗螨、抗过敏



Skin-friendly, warm, breathable



• 具有良好的生物相容性,可生物分解 Bio-based material has good biocompatibility, and it is biodegradable.

# 应用技术 ••••••••• Application Technology

**染色:**使用分散低温染料进行染色。 **Dyeing:** Dyeing with disperse cryogenic dyes.

**定型:** 染色温度和热定型温度≤ 115℃。

**Setting:** Dyeing temperature and heat setting temperature ≤ 115°C. **应用:** 聚乳酸纤维可以用于制作针织布、梭织布和非织造布。

**Application:** Polylactic acid fibers can be used to make knitted, woven and non-

woven fabrics.



纤维原貌图 Fiber in original appearance



纤维纵截面图 Fiber longitudinal section



纤维横截面图 Fiber cross section

	APPENDING TO A STATE OF THE STA
产品规格 Product specification	1.55dtex × 38mm
干断裂强度 (cN/dtex) Breaking tenacity in dry state	3.5-5.5
断裂伸长率 (%) Elongation at break	28-60
沸水收缩率 (%) Boiling water shrinkage	4-6
极限氧指数 (%) Limiting oxygen index	25-27
回潮率 (%) Moisture regain	0.6
抗螨性 (%) Mite resistance	≥ 99
抑 <b>菌性</b> Bacteria restraint	达到国家 3A 级 Reach national AAA level
	The second second



#### 纤维应用

#### **Fiber Application**

	服装用纺织品 Clothing textiles									
	休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater	
	$\sqrt{}$	$\sqrt{}$		$\sqrt{}$	$\sqrt{}$			$\sqrt{}$	$\sqrt{}$	
	贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining	
	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$						
	羽绒服 Down jacket	高端成衣 High-end ready- to-wear								
			!	家用纺织品 H	lome textiles					
j	床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel				
	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$				
ř			产业	L用纺织品 In	dustrial textil	les				
	汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies	
	$\sqrt{}$				√	$\sqrt{}$	$\sqrt{}$		$\sqrt{}$	
	军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks		
	$\sqrt{}$								$\wedge$	

#### O: 聚乳酸纤维在医用领域的应用, 你了解吗?

A:由于其生物相容性良好,可生物分解吸收,在医疗领域有着广泛的应用前景。如聚乳酸手术缝合线有较强的抗张强度,能有效控制聚合物的降解速率,随着伤口的愈合,缝合线自动缓慢降解消失。此外,还可应用于牙科材料、眼科植入材料、药用控制系统、人造皮肤、人造组织工程支架材料等医药学领域。

#### Q: Do you knew about application of PLA fiber in medical field?

**A:** Due to its good biocompatibility and biodegradable absorption, it has broad application prospects in the medical field. For example, the polylactic acid surgical suture has a strong tensile strength, which can effectively control the degradation rate of the polymer. As the wound heals, the suture automatically degrades slowly and disappears. In addition, it can also be used in medical fields such as dental materials, ophthalmic implant materials, medical control systems, artificial skin, and artificial tissue engineering scaffold materials.



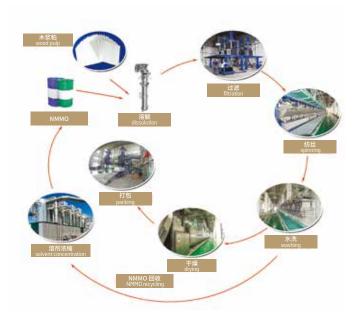
#### 细旦新溶剂法再生纤维素纤维

New-solvent Based Regenerated Fine Denier Cellulose Fiber

#### 制备技术 Processing Technology

将纤维素浆粕溶解于 NMMO/ 水的溶剂体系中,制成纤维素溶液,经干喷湿法纺丝制得再生纤维素纤维。

The cellulose spinning solution was prepared by dissolving cellulose pulp in the solvent of NMMO/water, and the regenerated cellulose fibers are made by dry jet wet spinning.



流程示意图 Flow Chart of Preparation

#### 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格

#### **Main Specifications**

普通棉型 Normal cotton type 1.0 dtex × 38mm

#### 标准及认证 Standards and Certifications

《莱赛尔短纤维》Lyocell staple fibers (FZ/T 52019-2018)

通过 OEKO-TEX 认证、中国化纤协会绿色纤维认证

Passed OEKO-TEX certification and green fiber certification of China Chemical Fibers Association





纤维纱

#### 纤维性能与制品特点

#### Fiber Performance and Product Features



•生物质、绿色环保、可生物降解 Biomass, green, biodegradability



• 吸湿导湿性强、透气性好、亲和舒适 Strong moisture absorption and moisture permeability, good air permeability, and skin-friendly quality and comfortableness



•可染性好、染色后色泽鲜艳、色牢度优良 Good dyeability, bright color after dyeing, excellent color fastness



• 织物手感柔软光滑、悬垂性好,易打理

The fabrics are smooth to the touch, good at draping and easy to be processed

产品规格 Product specification	干断裂强度 (cN/dtex) Breaking tenacity in dry state	湿断裂强度 (cN/dtex) Breaking tenacity in wet state	湿模量 (cN/dtex/5%) Wet modulus	干断裂伸长率 (%) Elongation at break in dry state
1.0 dtex × 38mm	≥ 3.80	≥ 3.40	≥ 0.10	≥ 14.5

#### 应用技术

#### /用技术

#### Application Technology

染色: 中温活性染料,雷玛素染料最适合染色。

**Dyeing:** medium-temperature reactive dyes, with the most suitable for dye is Remazol dyes.

**纺纱:** 纺纱时加适量的增磨剂有助于增加纤维的抱合力及可纺性。复精梳、纺纱时注意。轻定量、小牵伸、慢车速,避免纤维缠结形成毛粒。蒸纱温度低于 90°C,时间小于 20min。 **Spinning:** If a reasonable amount of grinding agents is added in the process of spinning it helps fibers have a better cohesive effect and a higher spinnability. Mind that the quantity should be carefully decided, the drawing force be small, the speed of machine be slow to prevent fibers from being tangled up into an untidy mass in the processes of re-combing and spinning. Yarn-steaming temperature is below 90°C, and the duration is shorter than 20min.

#### 纤维应用



服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$			$\sqrt{}$	$\sqrt{}$		$\sqrt{}$		
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
√-								
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
			家用纺织品 H	lome textiles				
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
$\sqrt{}$								
		لاعتر	业用纺织品 In	dustrial textil	es			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
				$\sqrt{}$	$\sqrt{}$	$\sqrt{}$		
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	口罩 Face mask
	$\sqrt{}$						$\sqrt{}$	$\sqrt{}$
								) /

#### Q: 细旦新溶剂法再生纤维素纤维服用性能较常规新溶剂法再生纤维素纤维有哪些优势?

A:细旦新溶剂法再生纤维素纤维吸湿导湿功能更加突出。由于纤维刚性低、曲率半径小,织物的手感更加柔软,亲肤性与护理功能俱佳,更适用于细纱纺的婴幼儿用品、贴身内衣,高端家居、轻透隐形面膜及特种纸张、汽车和工业过滤材料等领域。此外,还可用于制作医用湿巾、口罩、防护服等医疗卫生材料。

# Q: What are the advantages of new-solvent based regenerated fine denier cellulose fiber over regenerated cellulose fibers by conventional new-solvent based regenerated cellulose fiber?

**A:** The new-solvent based regenerated fine denier cellulose fiber has more prominent moisture absorption and moisture permeability. Because the fiber has low rigidity and small radius of curvature, the fabric feels softer and skin-friendly with good care. It is more suitable for spinning baby products, skin-friendly lingerie, high-end household, light invisible masks, wet wipes, precision instrument wipes, special papers as well as automotive and industrial filter materials. In addition, it can also be used to make medical wipes, masks, protective clothing and other medical and health materials.





#### 交联型新溶剂法再生纤维素纤维

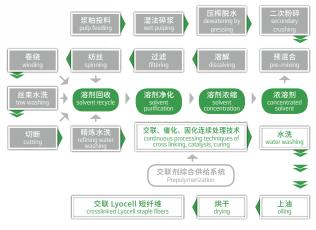
New-solvent Based Regenerated Crosslinked Cellulose Fiber

#### 制备技术

#### **Processing Technology**

对初生新溶剂法再生纤维素纤维进行交联处理,再经催化、 固化工艺,使交联剂与纤维发生反应,在纤维表面及内部形成 网状结构,其抗原纤化能力明显提高。

The cross linking treatment is performed on the nascent new-solvent based regenerated cellulose fiber, Then the catalyst and the curing process are used to make the cross linking agent react with the fiber, and the network structure forms on the surface and inside of the fiber, so the antigen fibrillation ability is significantly improved.



流程示意图 Flow Chart of Preparation

#### 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

短纤 Staple fiber 0.90~2.20dtex × 38mm

#### 标准及认证 Standards and Certifications

《莱赛尔短纤维》"Incell staple fibers" (FZ/T 52019-2018)

《交联莱赛尔短纤维》"Crosslinked lyocell staple fibers" (T/CCFA 01026-2016)

通过 OEKO-TEX、ISO 9001、ISO 14001 认证,完成绿色纤维认证

Passed OEKO-TEX, ISO 9001, ISO 14001 certification, and completed green fiber certification





纤维横截面图 Fiber longitudinal and cross section

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 优异的干、湿态力学性能,较好的抗原纤化能力,提高面料的使用次数和耐磨性 Excellent dry and wet mechanical properties, better antigen fibrillation ability, improving the number of use and abrasion resistance



• 因交联剂有助于染料的上染,染色性能优于常规莱赛尔纤维,色彩光鲜亮丽 Because the cross-linking agent helps dyeing, the dyeing performance is better than conventional lyocell fibers with bright and beautiful colors



• 织物具有良好的水洗稳定性、悬垂性、丰满柔软的手感、丝绸般的光泽
The fabrics have good washing stability, drapability, plump and soft hand feeling, silky luster

#### 应用技术

#### 业用技术

#### **Application Technology**

混纺:参考普通莱赛尔纤维,可与各种纤维进行混纺。

**Blending:** refers to normal lyocell fibers, which can be blended with various fibers.

丝光处理:不建议进行丝光处理。

Mercerization: mercerization is not recommended.

烧毛处理:参考普通莱赛尔纤维机织物的退浆;优先采用平幅退浆。

**Singeing:** refers to normal lyocell fibers Desizing of woven fabrics; open width desizing is preferred.

针织物预水洗:需要温水预清洗,去除纤维表面的油剂。

**Pre-washing of knitted fabrics:** pre-washing with warm water is required to remove the oil on the fiber surface.

防皱剂的使用: 为了避免折皱,建议整理步骤均使用防皱剂。

**Use of anti-wrinkle agents:** to avoid wrinkles, it is recommended to use anti-wrinkle agents in the finishing steps.

**染色:** 一般采用长车染色,不需砂洗。建议采用活性染料,染色工艺参考普通莱赛尔纤维。 **Dyeing:** generally continuous dyeing is used, and no sand washing is required; it is recommended to use reactive dyes, and the dyeing process refers to normal lyocell fibers.

增白和剥色: 最好将织物在中性或弱酸性介质中还原剥色。

Whitening and stripping: it is best to reduce and strip the fabric in a neutral or weakly acidic medium.



#### 交联型新溶剂法再生纤维素纤维 New-solvent based regenerated crosslinked cellulose fiber

VS



普通型新溶剂法再生纤维素纤维 Normal new-solvent based regenerated cellulose fiber

纤维种类 Fiber category	干断裂强度 (cN/dtex) Breaking tenacity in dry state	湿断裂强度 (cN/dtex) Breaking tenacity in wet state	湿模量 (cN/dtex/5%) Modulus in wet state	干断裂伸长率 (%) Elongation at break in dry state%	湿磨损次数(次) Wet abrasion number (times)
半交联 partial cross-linked	2.90	2.40	0.80	9.0	200
全交联 cross-linked	2.80	2.30	0.80	8.5	400

#### 纤维应用



#### **Fiber Application**

	•								
服装用纺织品 Clothing textiles									
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater	
$\sqrt{}$	$\sqrt{}$		$\sqrt{}$			$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining	
$\sqrt{}$	$\sqrt{}$	$\sqrt{}$						$\sqrt{}$	
羽绒服 Down jacket	高端成衣 High-end ready- to-wear								
			家用纺织品 H	lome textiles					
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel				
√	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$		$\sqrt{}$				
		产业	业用纺织品 in	dustrial texti	les				
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies	
				$\sqrt{}$	$\sqrt{}$	$\sqrt{}$		$\sqrt{}$	
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks		



# Q: 交联型新溶剂法再生纤维素纤维与普通新溶剂法再生纤维素纤维相比,哪些应用具有优势?

A:交联型新溶剂法再生纤维素纤维解决了普通新溶剂法再生纤维素纤维不适用于针织领域的短板。主要用于 40S 以上的高支纱,开发高密轻薄型面料。其面料更具丝绸般手感,适用于运动、内衣、家居服等针织领域。

# Q: What are the advantages of new-solvent based regenerated crosslinked cellulose fiber compared with normal new-solvent based regenerated cellulose fiber?

**A:** The new-solvent based regenerated crosslinked cellulose fiber solves the problem that normal new-solvent based regenerated cellulose fiber is not suitable in the knitting field. It is mainly used for high count yarns above 40S, and this yarn can be used to develop high-density, lightweight fabrics. The fabrics are more silk-like and suitable for sportswear, underwear and home wear in knitting field.



循环再生、周而复始。技术上覆盖物理法、化学法循环再生;同时赋予纤维抗紫外、常压可染、防水、防透视等功能;品种拓展到差别化聚酯纤维、聚酰胺纤维、再生纤维素纤维、聚丙烯腈纤维、氨纶,涵盖了主要品类的化学纤维,助力再生资源发展。

#### **Recommendation Reasons**

Regeneration goes round and round. It combine the physical and chemical regeneration methods; it gives the fiber antiultraviolet, normal pressure dyeable, waterproof, and antiperspective functions; varieties are expanded to differentiated PET fibers, PA fibers, regenerated cellulose fibers, acrylic fibers, and spandex, covering the main categories of chemical fibers to help the development of renewable resources.

#### 具体品种 Specific Variety

- 循环再利用 PET/PBT 双组份弹性复合纤维 Recycled PET/ PBT Bicomponent Elastic Composite Fiber
- 阳离子改性循环再利用聚酯纤维 Recycled Cationic Modified PET Fiber
- 防水原液着色循环再利用聚酯纤维 Dope Dyed Recycled Waterproof PET Fiber
- 循环再利用涤涤复合纤维 Recycled Polyester Composite Fiber
- 循环再利用聚酰胺 6 纤维 Recycled PA6 Fiber
- 循环再利用再生纤维素纤维 Recycled Cellulose Fiber
- 循环再利用聚丙烯腈纤维 Recycled Acrylic Fiber
- 循环再利用氨纶 Recycled Spandex



### 循环再利用 PET/PBT 双 组份弹性复合纤维

# Recycled PET / PBT Bicomponent Elastic Composite Fiber

# 制备技术

### **Processing Technology**

将再生 PET 切片和 PBT 切片分别进行熔融,通过双螺杆复合纺丝机和并列型喷丝板进行熔融纺丝,利用 PET 和 PBT 的性能差异,经热处理后形成卷曲和弹性效果。

The regenerated PET slice and PBT slice are melted separately, and melt spinning is performed by a twinscrew composite spinning machine and a side-by-side spinneret. The characteristic of PET and PBT is different, the curl and elastic performance of the composite fiber can be obtained after heat treatment.



流程示意图 Flow Chart of Preparation



### 

### 主要规格

### **Main Specifications**

DTY:55.6dtex/48F、83.3dtex/48F、166.7dtex/72F

### 标准及认证 Standards and Certifications

《再生涤纶牵伸丝》PLA staple fiber (FZ/T 54048-2012)

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 回潮性较好, 吸湿排汗效果好

Good moisture regain, good moisture absorption and sweat releasing effect



• 弹性和抗皱回弹性好,具有优异的三维卷曲弹性

Good elasticity and anti-wrinkle elasticity, with excellent three-dimensional curl elasticity



• 手感柔软丰满,光泽柔和,具有棉感

Soft and plump hand feeling, soft luster, cottony feel



•绿色低碳,其中 PET 成分来源于再生原料

Green and low carbon, where the PET component is derived from regenerated raw materials

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长 (%) Elongation at break (%)	网络度 (个/米) Network degree (pieces/meter)	沸水收缩率 (%) Boiling water shrinkage (%)	含油率 (%) Oil content (%)
55.6dtex/48F	3.12	23.1	87.9	3.5%	2.62

### 应用技术

### **Application Technology**

混纺: 可与各种纤维纱线混并。

Blending: various fiber yarns can be blended.

梭织:做经纱时,由于纤维弹性大,需注意张力。

Weaving: When warp yarns are made, the elasticity of the fiber is large. Pay attention to tension.



### 纤维应用

### **Fiber Application**

		服	装用纺织品 C	lothing textile	25			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$	$\sqrt{}$							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
$\sqrt{}$								

### Q:循环再利用 PET/PBT 双组份弹性复合纤维开发的价值体现?

A:无弹不成布,在保留 PET/PBT 双组份弹性复合纤维功能特性的情况下,该纤维的再利用系列不仅更加符合当下潮流的绿色环保概念,而且拓展了循环再利用化学纤维的品种。

# $\mbox{Q: What is the value of the development of regenerated PET <math display="inline">\slash$ bicomponent elastic composite fibers?

**A:** Fabrics cannot be made without elasticity. With the preservation of the functional characteristics of the PET / PBT bicomponent elastic composite fiber, the fiber regeneration series not only conform to the current concept of green environmental protection, but also expands the variety of regenerated chemical fibers.



### 阳离子改性循环再利用聚酯纤维

# Recycled Cationic Modified PET Fiber

### 制备技术 Processing Technology

采用先进的化学法循环再生技术与工艺装备,结合阳离子化学改性技术,制备再生阳离子聚酯切片,经熔融纺丝制备纤维。

Adopt advanced chemical regenerated technology and process equipment, combine with cationic chemical modification technology to prepare regenerated cationic polyester slice, and prepare fibers by melt spinning.





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### 主要规格

### **Main Specifications**

长丝 Filament yarns 22~165dtex /24F-288F (FDY) 33~330dtex/ 24F-288F (DTY)

### 标准及认证

### Standards and Certifications

《再生涤纶牵伸丝》 Regenerated polyester drawn yarns (FZ/T 54048-2012) 通过 OEKO-TEX、ISO 9001、ISO 14001 认证、Intertek Passed OEKO-TEX, ISO 9001, ISO 14001 certification, Intertek

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 化学法循环再生,实现资源再利用 Regenerated by chemical method to realize resource reuse



再生和阳离子同时具备、常压可染
 Both regeneration and cations are available, and can be dyed at normal pressure



• 细旦化、品质等同原生阳离子产品 Fine denier, quality equivalent to native full-dull products

产品规格 Product specification	断裂强度 (cN/dtex) Breaking Tenacity	断裂强度变 异系数 (%) Breaking tenacity CV	断裂伸长率 (%) Elongation at break	断裂伸长率 变异系数 (%) Elongation CV at break	卷曲收缩率 (%) Crimp Shrinkage	沸水收缩率 (%) Boiling water shrinkage	染色等级 Dyeing grade
84dtex/72F	2.79	0.54	31.47	7.08	10.28	4.46	4.5

# 应用技术 ◆ · · · · · · · · · Application Technology

参考原生阳离子聚酯纤维 Refer to native cationic PFT fiber



		产	业用纺织品 Ind	dustrial texti	les			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
		$\sqrt{}$						

### Q: 化学法再利用聚酯纤维的市场导向性及下游认可度情况如何?

A: 当今社会对产品环保性能及功能的重视程度日益增加,化学法循环再利用技术相比传统以石油提炼为原料的生产工艺,CO2 排放量降低 52%,能源消耗量减少 39%。兼具环保、舒适、功能性等特点的再生聚酯纤维,产品种类进一步丰富,更加容易被消费者接受与认可。

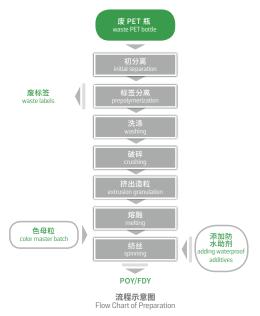
# Q: What is the market orientation and downstream recognition of chemical recycled PET fibers?

**A:** Nowadays, the society pays more attention to the environmental protection performance and functions of products. Compared with the traditional production process that uses petroleum refining as the raw material, CO2 emissions are reduced by 52% and energy consumption is reduced by 39% with the application of the chemical regenerated technology. Recycled PET fibers with characteristics of environmental protection, comfort and functionality are further diversified and are more easily accepted and recognized by consumers.



### 防水原液着色 循环再利用聚酯纤维

# Dope Dyed Recycled Waterproof PET Fiber



### 制备技术 Processing Technology

以 100% 废弃聚酯瓶为原料,通过装备 再造、智能调色等技术集成,并在纺丝 过程中添加防水助剂,实现纤维原液着 色和防泼水功能。

The 100% waste polyester bottle is used as the raw material, and the technology is integrated through equipment recycling, intelligent color matching, etc., and the waterproof additive is added during the spinning process to realize the fiber dope dyeing and water repellent function.

### 纤维及制品特点

### **Characteristics of Fiber and Product**

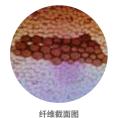
### 主要规格 Main Specifications

长丝 Filament yarns 55~333 dtex /24~96F

### 标准及认证 Standards and Certifications







Fiber longitudinal section

《再生有色涤纶低弹丝》(FZ/T 54096-20017)

Regenerated colored polyester low-elastic yarns

《一种基于三基色原理的 PET 纤维生产方法及生产系统》(201810929501.6)

Method and system for producing PET fibers based on three primary colors

通过 OEKO-100、ISO 9001、ISO 14001、OHSAS18001、GRS 认证

Passed 0EK0-100, ISO 9001, ISO 14001, 0HSAS18001, GRS certification

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 物理法再生,实现资源再利用 Regenerated by physical method to realize resource reuse



• 减少染整能耗、缓解排放,绿色环保、色牢度高、多色系 Reduce energy consumption of dyeing and finishing, reduce emissions, green environmental protection, high color fastness, multi-color system



• 防泼水,防水性等级达到 70 Water-repellent, waterproof level at 70



• 小批量、高品质、快反应 Small batch, high quality, fast response

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂强度变 异系数 (%) Breaking tenacity CV	断裂伸长率 (%) Elongation at break		卷曲收 缩率 (%) Crimp shrinkage	沸水收缩率 (%) Boiling water shrinkage	含油率 (%) Oil content	色牢度 (级) Color fastness (level)
135dtex/36F	≥ 3.08	≤ 4.31	31.35	≤ 6.76	12.34	4.1	2.58	4-5

### 应用技术

# Application Technology

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**后整理:** 后整理时定型温度 <160 度。

**After-treatment:** Setting temperature <160°C during after-treatment.

### 纤维应用



### **Fiber Application**

		服	装用纺织品 C	lothing textile	es			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$	$\sqrt{}$						$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
			$\sqrt{}$	$\sqrt{}$				
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
	$\sqrt{}$							
			家用纺织品 H	ome textiles				
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
	$\sqrt{}$		$\sqrt{}$					
		产业	业用纺织品 In	dustrial textil	es			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
$\sqrt{}$								



### Q: 为什么在纤维上做防水而不直接在纺织品上做防水?

A: 纺织品上做防水处理一般是在染整后处理工序中进行,本产品为原液着色纤维,无需进行染色,在纤维上实现防水省去了后道整理工艺。例如,飞织运动鞋面,是直接将原液着色的纱线做成鞋面,无需后整理工序。如果要给飞织运动鞋面做防水效果,就需要每个鞋面单独进行处理,这样会导致效率低下,且耗材耗能。再比如织带、背包肩带、户外服装的商标等,都不适合织完后再通过后整理做防水效果。因此直接在纤维实现防水,效果更好,且免除了后整理工序,节能环保。

### O:直接在纤维状态做的防水效果与织物做的防水效果有什么差别?

A:在织物后整理时添加防水助剂能达到防水效果,因为防水层附着在织物表面,耐久性和稳定性相对纤维状态做的防水效果会较差,直接在纤维状态做的防水性能会更高,持久性更强,但是成本也相应增加。

### Q: Why do waterproofing on fabrics and not directly on textiles?

**A:** The waterproof treatment on textiles is generally carried out in the post dyeing and finishing process. This product is a dope dyed fiber which does not need to be dyed and post-finished, so the waterproof treatment can only be achieved on the fiber. For example, fly-knit sports shoe uppers are made directly from the dope-dyed yarns and do not require a after-treatment process. If the fly-knit sports shoe uppers need waterproof treatment, each upper should be treated separately, which will cause inefficiency and materials and energy consumption. For another example, webbing, backpack shoulder straps, outdoor clothing trademarks, etc., are not suitable for waterproofing with after-treatment. Therefore, it is better to do waterproofing directly on the fiber, thus eliminating the after-treatment process, saving energy and protecting the environment.

# Q: What is the difference in the waterproof effect made directly in the fiber state and on the fabrics?

**A:** Adding a waterproof additive during fabric after–treatment can achieve the waterproof effect, because the waterproof layer is attached to the surface of the fabric, the durability and stability will be worse than that of the fiber state. Higher waterproofness and stronger durability can be achieved in the fiber state, but the cost increases accordingly.



### 循环再利用涤涤复合纤维

# Recycled Polyester Composite Fiber

### 制备技术 Processing Technology

以再生切片为原料,经熔融纺丝制备再生 POY 和 FDY,再将 POY 和 FDY 进行合股网络,制备再生涤涤复合丝。

The regenerated POY and FDY are prepared by melt spinning and using the regenerated slice as raw materials, and then the POY and FDY form a stranding network to prepare recycled polyester composite yarns.



流程示意图 Flow Chart of Preparation

### 

### 主要规格 Main Specifications

长丝 Filament yarns 47~230dtex/32~128F

### 标准及认证 Standards and Certifications

《涤 / 涤复合丝》Polyester / polyester composite yarns (Q/320584 NPA007-2019) 通过 OEKO-TEX、ISO 9001、ISO 14001、GRS 认证

Passed OEKO-TEX, ISO 9001, ISO 14001, GRS certification



纤维原貌图 Fibers in original appearance



纤维截面图 Fiber in Section

### 纤维性能与制品特点 Fiber Performance and Product Features



物理再生,实现资源再利用
 Physical regeneration for resource reuse



• 复合纤维由再生 POY 和再生 FDY 网络而成、具有异收缩性、 兼具绒感滑感,细旦化后具有真丝感

The composite fiber is made of regenerated POY and FDY, which has neterogeneous shrinkage and velvety smoothness, and a silky feeling after fine denier.



• 织物布面饱满、柔软富有弹性、不起皱、悬垂性强

Full fabric surface, soft and flexible, no wrinkles, strong drapability

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂强度变异 系数 (%) Breaking tenacity CV(%)	断裂伸长率 (%) Elongation at break	断裂伸长变 异系数 (%) Elongation CV at break	网络度 (个/m) Network degree (pieces/m)	沸水收缩率 (%) Boiling water shrinkage	含油率 (%) Oil content	染色均匀性 (级) Dyeing evenness (level)
150dtex/108F	2.11	2.51	31.1	4.42	13	12.4	0.79	≥ 4.0

### 应用技术

### **Application Technology**

**整经:** 整经张力≤纤度 \*0.1g, 整经车速≤ 400m/min。

**Warping:** Warping tension ≤ fineness \* 0.1g, warping speed ≤ 400m / min.

**上浆:** 上浆率≥ 7%,上浆烘箱和锡林的温度以烘干浆料的温度为标准,越低越好。

**Sizing:** Sizing percentage≥7%. The temperature of the sizing oven and the cylinder is based on the temperature of the drying slurry. The lower the better.

络丝:络丝张力≤纤度 \*0.1g, 倍捻:倍捻张力保持包围角在 90°~270°。

Winding: Winding tension fineness \* 0.1g, Twisting: Twisting tension keeps the enclosing angle

between 90°C - 270°C.

**蒸纱:** 蒸纱温度在 65℃~85℃之间。

**Yarn steaming:** The temperature of yarn steaming is between  $65^{\circ}\text{C}$  –  $85^{\circ}\text{C}$ .

染色: 染色过程中应充分除油, 避免染色条痕。

**Dyeing:** During the dyeing process, the oil should be fully removed to avoid dyeing streaks.

后整理: 后整理避免长时间日光和紫外光照射。

After-treatment: After-treatment should avoid prolonged sunlight and ultraviolet light.



### 纤维应用

### **Fiber Application**

		服	装用纺织品 C	lothing textile	!S			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$	$\sqrt{}$		$\sqrt{}$		$\sqrt{}$		$\sqrt{}$	$\sqrt{}$
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
	$\sqrt{}$							
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
			家用纺织品 H	lome textiles				
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
	$\sqrt{}$		$\sqrt{}$		$\sqrt{}$			

### Q: 循环再利用涤涤复合纤维的下游制品特点?

A: 通过针织大圆机、机织(喷水、喷气、剑杆)等机械,主要织造仿毛、绒、麻类面料。如: 氨纶汗布、裤料、复合雪纺、绒雪纺、法国绒乱麻、风衣面料等。面料线条流淌,手感饱满,悬垂性强,主要面向高档女性时装。

### Q: What are the characteristics of downstream products of recycled polyester fibers?

**A:** Through knitting circular machine, weaving (water jet, air jet, rapier) and other machinery, wool–like, velvet and linen fabrics are woven, such as: spandex jersey, trousers, composite chiffon, cashmere chiffon, French cashmere, linen, etc. The fabric lines are flowing with full fabrics and strong drapability, mainly for high–end women's fashion. Fine denier regenerated composite yarns have the characteristics of silk after twisting.



### 循环再利用聚酰胺 6 纤维

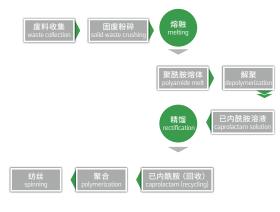
# Recycled PA6 Fiber

### 制备技术

### **Processing Technology**

将聚酰胺6纤维、废丝或成品等废弃物经物理回收后熔融造粒,或采用化学法制备的再生聚酰胺6切片,经熔融纺丝制得。

Wastes such as PA6 slice, waste yarns or finished products are melted and granulated after physical recycling; or regenerated PA6 slice prepared by chemical methods are made by melt spinning.



流程示意图 Flow Chart of Preparation

# 纤维及制品特点 •••••••••••• Characteristics of Fiber and Product

### 主要规格 Main Specifications

长丝 Filament yarns 44.4~77.8 dtex / 24~68F (FDY) 44.4~155.6 dtex / 34~136F (DTY)

### 标准及认证 Standards and Certifications

《锦纶牵伸丝》Nylon drawn yarns (GB/T 16603-2017) 专利《一种锦纶 6 纺丝废丝的回收装置》 Patent of "A recycling device for nylon 6 spinning waste" (ZL201520255912.3)

### 纤维性能与制品特点 Fiber Performance and Product Features



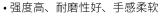
• 物理化学再生,实现资源再利用

Physical and chemical regeneration for resource reuse









High strength, good abrasion resistance, soft hand feeling



•产品均匀性稳定性高

High uniformity and stability of the product

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂强度变异系数 (%) Deviation coefficient of breaking tenacity	断裂伸长率 (%) Elongation at break	卷曲收缩率 (%) Crimp shrinkage	卷曲稳定性 (%) Crimp stabilly	染色均匀度 (级) Uniformity in dyeing (level)
77.8dtex/48F (DTY)	≥ 4.0	≤ 8.0	26 ± 4	≥ 15	≥ 25	≥ 4

# 应用技术 ●・・・・・・ Application Technology

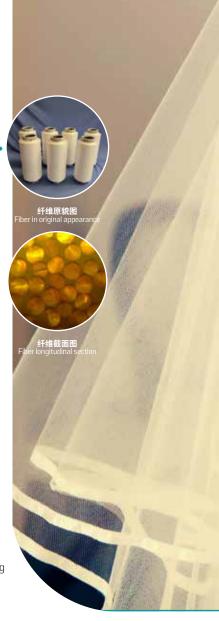
染色: 染色过程中应充分除油, 避免染色条痕。

Dyeing: During the dyeing process, the oil should be fully removed to avoid dyeing

streaks

后整理: 后整理避免长时间日光和紫外光照射。

**After-treatment:** after-treatment should avoid prolonged sunlight and ultraviolet light.



### 

		服	装用纺织品 C	lothing textile	es			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$							$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
		$\sqrt{}$					$\sqrt{}$	
羽绒服 Down jacket	高端成衣 High-end ready-							

### Q:循环再利用聚酰胺 6 纤维节能环保体现及市场应用情况?

A:循环再利用聚酰胺6纤维的开发,避免了因废丝所造成的资源浪费和生产成本增加,生产过程低碳环保,每生产1吨再生聚酰胺6纤维,可减少27%二氧化碳排放,减少填埋及海洋污染。在行业应用过程中,产品系列均得到客户认可,认知度在不断提升,具有良好的经济效益和社会效益。

# Q: What about energy saving and environmental protection of recycled PAG fiber and its market application?

**A:** The development of recycled PA6 fiber avoids the waste of resources and increased production costs caused by waste yarns. The production process is low-carbon and environmental-friendly. For each ton of recycled PA6 fiber produced, 27% of carbon dioxide emissions and landfill as well as marine pollution can be reduced. In the industrial application process, the product series have been recognized by customers, and band recognition is constantly increasing, which has good economic and social benefits.



### 循环再利用再生纤维素纤维

# Recycled Cellulose Fiber



### 制备技术 Processing Technology

将回收浆粕经过浸渍、溶解、熟成、过滤后得到供纺丝 的再生纤维素纤维原液,经湿法纺丝工艺、精练及烘干 后制备。

The recycled pulp is impregnated, dissolved, matured, and filtered to obtain a regenerated cellulose fiber solution for spinning, which is prepared by a wet spinning process, refining and drying.



### 纤维及制品特点

### **Characteristics of Fiber and Product**

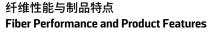
### 主要规格 **Main Specifications**

短纤 Staple fibers 1.33dtex~1.67dtex  $\times 38$ mm

### 标准及认证 Standards and Certifications

《粘胶短纤维》Viscose staple fibers (GB/T 14463-2008)

通过 OHSMS18000 三体系认证、OEKO-100 生态纺织品质量认证 Passed OHSMS18000 three-system certification, OEKO-100 ecological textile quality certification





• 资源再生,再生品种拓展 Regeneration of resources and expansion of regenerated varieties



• 纤维亲和舒适、力学指标与原生相当 Fiber affinity and comfort, and mechanical indicators are comparable to the original



• 面料手感柔软,质感光滑,褶皱回复率好,尺寸稳定性好 The fabric feels soft and smooth, with good wrinkle recovery and good dimensional stability

产品规格 Product specification	干断裂强度 (cN/dtex) Breaking tenacity in dry state	湿断裂强度 (cN/dtex) Breaking tenacity in wet state	干断裂伸长 (%) Breaking tenacity in dry state	颜色 Colors
$1.33 dtex \times 38 mm$	2.45	1.23	21.1	淡蓝色

# 应用技术

### **Application Technology**

混纺: 可与各种纤维纱线混并。本纤维所用浆粕原料回收来源不同,纤维呈淡蓝色,纺纱 前注意混批,使颜色分散均匀。

Blending: Various fiber yarns can be mixed. The pulp raw materials used in this fiber have different recycling sources. The fiber is light blue. Pay attention to mixing batches before spinning to make the color evenly dispersed.



Fibers in original appearance



纤维截面图 Fiber longitudinal section





### 纤维应用



### **Fiber Application**

休闲服 户外运动服 安全						
	於护服 家居服 rotection suit Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$						
贴身内衣 围巾 名 Lingerie Scarf	妹子 鞋材 Sock Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
$\sqrt{}$						
羽绒服 高端成衣 Down jacket High-end ready- to-wear						

### O: 循环再利用再生纤维素纤维的意义?

A: 大量服装废弃后不但造成资源的浪费,也会造成环境污染。利用回收的废旧牛仔衣物制造浆粕生产再生纤维素纤维,保证纤维品质的同时极大的降低了资源消耗,节约了浆粕制造成本,真正实现了由纤维源头至终端产品的闭合循环。

### Q: 循环再利用再生纤维素纤维的市场前景?

A:在服装品牌日益注重衣物环保可回收的趋势下,采用废旧衣物回收浆粕制造的循环 再利用再生纤维素纤维,符合当今绿色环保的时尚理念,具有良好的市场前景。

### Q: What is the significance of regenerated cellulose fibers?

**A:** Massive clothing abandonment will not only cause waste of resources, but also environmental pollution. Regenerated cellulose fibers are produced by using recycled waste denim clothing to make pulp, ensuring fiber quality and reducing resource consumption, saving pulp manufacturing costs, which has truly achieved a closed cycle from fiber source to end product.

### Q: What is the market prospect of regenerated cellulose fibers?

**A:** Under the trend that clothing brands have increasingly paid attention to environmental protection and recyclability of clothing, the regenerated cellulose fibers made from waste clothing recycled pulp are in line with the current green environmental protection fashion concept and have a good market prospect.



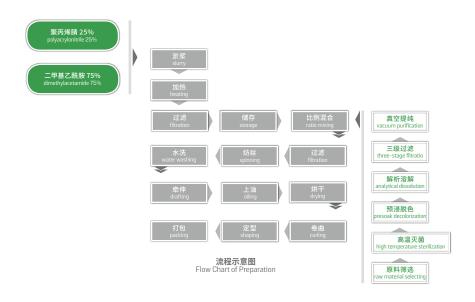
### 循环再利用聚丙烯腈纤维

# Recycled Acrylic Fiber

### 制备技术 Processing Technology

将回收的废旧腈纶下脚料、废旧腈纶织物通过溶解、浓缩、提纯等关键技术,重新制成聚丙烯腈原液,生产再生腈纶纤维。

The recycled waste acrylic scraps and waste acrylic fabrics are reconstituted into an acrylic solution through key techniques such as dissolution, concentration, and purification to produce recycled acrylic fibers.



### 纤维及制品特点

### **Characteristics of Fiber and Product**

### 纤维原貌图

### 主要规格

### **Main Specifications**

短纤:可按客户需求切长,1.33~6.67dtex

Staple fibers: 1.33-6.67dtex, can be cut to length according to customer requirements

毛条:平均长度 102mm, 1.33~6.67dtex

Wool tops: 1.33-6.67dtex, with average length 102 mm

### 标准及认证 Standards and Certifications

《GB/T 16602-2008》( 腈纶短纤维丝束 )

Acrylic staple fiber tows

《FZ/T 53002-2012》( 腈纶毛条 )

Acrylic wool tops

通过 GRS 认证

Passed GRS certification



纤维截面图 Fiber in section

### 纤维性能与制品特点

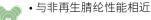
### Fiber Performance and Product Features



• 资源再生,降低石油的消耗,减少资源浪费 Resource regeneration reduces oil consumption and resource waste







具有质轻、蓬松柔软、保暖性好、染色鲜艳、耐紫外线等特点 Similar performance to non-regenerated acrylic with characteristics of lightweight, fluffiness and softness, good warmth, Bright dyeing colors, UV resistance, etc

产品规格 Product specification	线密度偏差率 (%) Linear density deviation	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Elongation at break	回潮率 (%) Moisture regain	DMAC (%)	染色饱和值 Dyeing saturation value
短纤 1.67 dtex	± 6	≥ 2.75	≥ 40	1.8~2.3	≤ 0.1	± 2

### 应用技术



### **Application Technology**

参考常规聚丙烯腈纤维使用方法。

Refer to the conventional use of polyacrylonitrile fiber.



### 纤维应用

### •

### **Fiber Application**

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$			$\sqrt{}$					$\sqrt{}$
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
√	$\sqrt{}$	$\sqrt{}$						
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
$\sqrt{}$			$\sqrt{}$	$\sqrt{}$				
		P=1	业用纺织品 In	dustrial textil	les			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
					$\sqrt{}$			
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	



### Q: 循环再利用聚丙烯腈纤维的价值体现在哪里?

A: 循环再利用聚丙烯腈纤维以回收腈纶废料为目的,使腈纶产品进一步循环利用。该 纤维卷曲较好,膨松性良好,能够在一定程度上替代羊绒、羊毛等毛纺制品,实现了资 源的节约和高效利用,符合可持续发展理念。

### Q: Where is the value of recycled acrylic fibers?

**A:** The purpose of recycled acrylic fibers is to recycle acrylic waste materials so that acrylic products can be further recycled. The fiber has good curling and fluffiness, which can replace woolen products such as cashmere and wool to a certain extent. Thus, resource conservation and efficient utilization can be achieved in line with the concept of sustainable development.



### 循环再利用氨纶

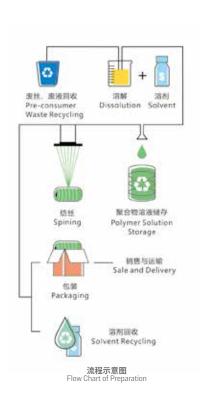
# Recycled Spandex

### 制备技术 Processing Technology

将氨纶生产过程中的废丝,经粉碎、真空烘干、DMAC 进行溶解, 经特定的工艺处理后,制备聚合原液纺丝制成。

The waste yarns and waste solution in the spandex production process are crushed, vacuum–dried, and dissolved in DMAC to prepare a polymer solution spinning through a specific process.





### 

纤维原貌图 Fibers in original appearance

### 主要规格 Main Specifications

44dtex/3F

### 标准及认证

### **Standards and Certifications**

《功能型氨纶长丝》(Q/HFA 102-2019)

Functional spandex filaments

《一种利用氨纶废丝生产高回弹氨纶纤维的方法》(ZL201210531807.9)

Method for producing high-resilient spandex fibers by using spandex waste yarns

获得纺织服装全球回收标准 GRS 认证证书

Obtained GRS certification for global textile and apparel recycling standards

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 资源再生,拓展新品种

Resource regeneration and expansion of new varieties



• 具有普通氨纶长丝伸长、高弹性回复率等特点 With characteristics of normal spandex filament elongation,

high elastic recovery, etc.

产品规格 Product specification	断裂强度 断裂伸长率 (cN/dtex) (%) Breaking tenacity Elongation at brea		300% 伸长时强度 (cN/dtex) 300% elongation tenacity	300% 伸长弹性回复率 (%) 300% elongation elastic recovery	
44dtex/3F	≥ 1.10	$510 \pm 40$	≥ 0.15	≥ 90.0	

### 应用技术 ●・・・・・・ Application Technology

参照常规氨纶产品。

Refer to conventional spandex products.



### 纤维应用



### **Fiber Application**

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
	$\sqrt{}$							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
$\sqrt{}$		$\sqrt{}$	$\sqrt{}$					
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
$\sqrt{}$								



### Q: 循环再利用氨纶的环保理念是什么?

A: 循环再利用氨纶的开发是一个对氨纶生产过程中的废料进行回收再利用,"变废为宝" 的项目,整个工艺技术高效、制备过程中大大减少了固废的产生。对倡导清洁生产、保 护生态环境等方面具有重要的意义。符合国家和消费者的环保理念,也符合国际品牌的 理念。

### Q: What is the environmental protection concept of recycled spandex?

**A:** The development of recycled spandex is a project that recycles and reuses the waste in the spandex production process, turning the waste into a treasure. The entire process technique is of high efficiency and the production of solid waste is greatly reduced during the preparation process. It is of great significance for advocating clean production and protecting the ecological environment. It is in line with the national and consumers' environmental protection concept, as well as the concept of international brands.



### 推荐理由

原液着色、魔术大师。节能降耗、低碳环保是原液着色化学纤维的底色,而高色牢度、高均匀性的色彩点缀,更显时尚气息。低纤度咖啡色聚酰胺 6 纤维更专注在袜业、内衣上的发挥,颜色可定制的 PE-PP 皮芯复合纤维,精准对接特殊纺织品需求。

### **Recommendation Reasons**

Dope dyeing is a magic master. Energy saving, low carbon consumption, and environmental protection are the background color of the dope dyed chemical fibers. Technological upgrading and function superposition are the roles of the dope dyed chemical fibers. Coffee PA6 fiber with low fineness is more focused on the hosiery and underwear, and the color can be customized with PE-PP sheath-core fiber to precisely meet the needs of special textiles.

# Dope Dyed Chemical Fiber

### 具体品种 Specific Variety

- 低纤度原液着色聚酰胺 6 纤维 Dope-dyed PA6 Fiber With Low Fineness
- 原液着色 PE/PP 皮芯复合纤维 Dope-dyed PE/PP Sheath-core Fiber

· 绿动



### 制备技术 Processing Technology

采用母粒在线添加技术,攻克高浓度母粒的分散与低纤度纺丝难以兼容的难题,经熔融纺丝制备。

The master batch on-line addition technology is used to overcome the difficulty of compatibility between the dispersion of high concentration master batch and low-density spinning. The fiber is prepared by melt spinning method.

### 纤维及制品特点 ●・

### **Characteristics of Fiber and Product**

### 主要规格 Main Specifications

长丝 Filament yarns 13.3dtex/5F (FDY)



《锦纶牵伸丝》 Nylon drawn yarns (GB/T 16603-2017) 《锦纶牵伸丝》 Nylon drawn yarns (Q/0601 YHR007-2017) 《生产细旦锦纶 66 全牵伸丝的方法》 Method for producing fine-denier nylon 66 full drawn yarns (ZL200910171203.6)



纤维原貌图 Fibers in original appearance



纤维截面图 Fiber longitudinal section

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 纤度低、亲肤舒适 Low-fineness, skin-friendly and comfortable



• 采用原液着色技术、色泽均匀、颜色丰富

Adopt dope dyeing technique with uniform and enriched colors

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂强度变异 系数 (%) Deviation coefficient of breaking tenacity	断裂伸长 率 (%) Elongation at break	断裂伸长率 变异 (%) ElongationCV at break	(%)	水洗色 牢度 Washing color fastness	摩擦色 牢度 Rubbing color fastness	颜色 Colors
13.3dtex/5F	4.54	3.69	44.9	6.12	10	≥ 4.5	≥ 4.5	咖啡色 brown

### 应用技术

### **Application Technology**

染色: 用于包纱或织袜,不必进行染色。

**Dyeing:** It is used for covering yarn or weaving socks without dyeingrefer to normal PA6 filaments (FDY).

定型:参考普通聚酰胺6长丝(FDY),定型温度不得超过130℃。

**Setting:** setting temperature must not exceed 130 °c.



Q:何为低纤度,低纤度为下游应用领域带来的优势是什么?

A: 对于聚酰胺 6 纤维,一般将总旦数低于 20D 的纤维称为低纤度,该纤维纤度为 13.3dtex,即 12D,为低纤度聚酰胺 6 纤维。主要应用领域为高端一体裤、丝袜。低纤度为丝袜带来轻薄透明的效果,由于其断裂强度高,可保证丝袜耐磨性能和不易勾丝。

# Q: What is low fineness, and what are the advantages of low fineness for downstream applications?

**A:** For PA6 fibers, fibers with a total denier of less than 20 are generally referred to as low fineness. The fiber fineness is 13.3 dtex, that is, 12D, which is a PA6 fiber with low fineness. The main application areas are high-end one-piece pants and stockings. The low fineness brings a thin, transparent effect to stockings. Due to its high breaking tenacity, it can ensure the abrasion resistance and snagging-free of stockings.



### 原液着色 PE/PP 皮芯复合纤维

# Dope-dyed PE/PP Sheath-core Fiber

# 

### 制备技术 Processing Technology

以熔点较高的 PP 作为芯层,熔点较低的 PE 作为皮层,皮层和芯层分别添加色母粒,经复合纺丝制备,皮芯颜色可以定制。

PP with higher melting point is used as the core layer and PE with lower melting point is used as the skin layer. The color master batch is added to the skin layer and core layer respectively, and the sheath core colors can be customized by composite spinning method.

### 纤维及制品特点

### **Characteristics of Fiber and Product**

### 主要规格

### **Main Specifications**

长丝 Filament yarns 110~165 dtex /48F



纤维原貌图 Fiber in original appearance

### 标准及认证 Standards and Certifications

《丙纶牵伸丝》Polypropylene drawn yarns (FZ/T 54008-2012) 《丙纶工业长丝》Polypropylene industrial filaments (T/CCFA 01041-2019)



纤维截面图 Fiber longitudinal section

### 纤维性能与制品特点

### **Fiber Performance and Product Features**

•皮层为 PE 熔点 88°C,比例占 30%,芯层为 pp 比例占 70%。可替代传统的胶水涂层工艺,更加环保安全

The skin layer is pe with a melting point of  $88^{\circ}$ c, accounting for 30%, and the core layer is pp, accounting for 70%. It can replace the traditional glue coating process, more environmentally friendly and safe.



• 采用原液着色技术、色牢度高、皮芯颜色可定制
With adopting the done during technique, the color factness is l

With adopting the dope dyeing technique, the color fastness is high, and the skin core color can be customized.



• 质轻、凉感、强度高

lightweight, cool feeling, high strength

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Elongation at break	皮层 PE 熔点 (度) PE melting point in skin layer (degree)		色牢度(级) Color fastness
111dtex/48F	3.9	75	88	1000 小时 hours	4-5



**PE/PP 纤维织成布** PE/PP fiber woven cloth



PE/PP 纤维上织机 PE/PP fiber loom

### 应用技术

### **Application Technology**

定型: 建议热轧温度 100℃左右。

**Setting:** Recommended heat rolling temperature is about 100  $^{\circ}$  C.



# 纤维应用 •••• Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
	$\sqrt{}$				$\sqrt{}$		$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
			$\sqrt{}$	$\sqrt{}$				$\sqrt{}$
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$				
		P=1	L用纺织品 In	dustrial textil	les			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
					$\sqrt{}$			
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
$\sqrt{}$								



### Q: 原液着色 PE/PP 皮芯复合纤维的应用原理和特点是什么?

A:原液着色 PE/PP 皮芯复合纤维经过织造后,通过热烘或热轧处理,低熔点的皮层聚乙烯熔融形成膜,高熔点的芯层高强度聚丙烯纤维保持不变,成为膜的强力筋架,增加膜的强度;且织造后的织物纤维与纤维间存在交织点通过控制热烘工艺,交织点熔合进一步提高织物强度,可用于伞布等。

# Q: What are the application principles and characteristics of dope-dyed PE-PP sheath-core fibers?

**A:** After woving of the dope-dyed PE-PP sheath-core fiber, polyethylene in the skin layer with low-melting point is melted to form a film through heat baking or heat-rolling treatment. High-strength polypropylene fiber in the core layer with high-melting point remains unchanged and becomes a strong frame of the film to increase the strength of the film; and there are interweaving points between the woven fabric fibers and the fibers. By controlling the heat-baking process, the interweaving points are fused to further improve the strength of the fabrics, which can be used for umbrella cloth, etc.



# Exquisite Creativity

慧心巧思,妙想异构。创新已渗透中国纤维的灵魂,中国纤维从未停止探索,与锌离子、纳米光催化因子、碳纳米管、无卤阻燃剂等新兴元素融合,打造抑菌、消味,导电、阻燃性能再升级。海藻提取、膜膨化、气流辅助静电纺丝、驻极熔喷纺丝等技术的研发,助力纤维在口罩、防护服等医疗领域大放异彩……满足消费者对舒适、健康、安全的追求,亦成就一份心旷神怡的精神向往。

Chinese fiber brings together people's bright mind, ingenious ideas, wonderful inspiration and creative concept. The innovation has permeated into the soul of Chinese fiber, yet Chinese fiber has never stopped exploring. It has integrated with emerging elements such as zinc ions, nano-photocatalyst, carbon nanotubes, and halogen-free flame retardant. It can be soft and skin-friendly, and can inhibit bacteria, eliminate smell, conduct electricity, resist flame, prevent melting drops, etc., meeting consumers' pursuit of comfort, health and safety and their spiritual longing for delight.

FIBER



### 具体品种 Specific Variety

### • 锌系抑菌聚酯纤维

Zinc Antibacterial PET Fiber

### • 纳米光催化抑菌除异味聚酰胺 6 纤维

Nano-photocatalytic PA6 Fiber of Anti-bacterial and Deodorant Functions

### • 碳纳米管添加改性皮芯复合导电聚酯纤维

Sheath-core Conductive PET Fiber Modified with Carbon Nanotubes

### • 中空异形再生纤维素纤维

Regenerated Hollow-shaped and Profiled Cellulose Fiber



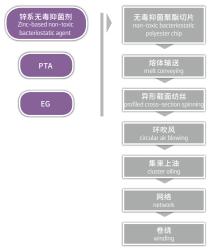
### 锌系抑菌聚酯纤维

# Zinc Antibacterial PET Fiber

### 制备技术 Processing Technology

以锌系抑菌剂作为改性剂,结合功能助剂对聚酯进行共 聚改性,及对独特的异形截面进行设计,经熔融纺丝 制备。

The polyester is modified through in–situ polymerization method by zinc–based bacteriostatic agent and copolymerized method with functional agent. Besides that a unique profiled section is designed and then fibers are prepared by melt spinning.



流程示意图 Flow Chart of Preparation

### 纤维及制品特点

### Characteristics of Fiber and Product

### 主要规格 Main Specifications

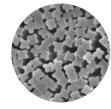
长丝 Filament yarns 55dtex/36F

### 标准及认证 Standards and Certifications

《抗菌涤纶短纤维》Bacteriostatic Dacron Short Fiber (FZ/T 52035-2014) 《抗菌涤纶长丝》Bacteriostatic Dacron Filament (DB35/T 1058-2010) 通过 SGS 认证 Certified by SGS



纤维原貌图 Fiber in original appearance



纤维截面图 Fiber longitudinal section

### 纤维性能与制品特点

### **Fiber Performance and Product Features**



• 具有持久的抑菌性,不水解不挥发 Persistent bacteriostatic, not hydrolyzed or volatile



• 具有良好的防霉功能、除臭功能 Favorable anti-mildew function and deodorizing function



• 安全技术达到婴幼儿纺织产品要求 Safety technology meets requirements of infant textile products

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Extension at break	卷曲收缩 率 (%) Crimp Shrinkage rate	沸水收缩 率 (%) Boiling water shrinkage rate	大肠杆菌 抑菌率 (%) Escherichia coli bacteriostasis rate	金黄色葡萄球 菌抑菌率 (%) Staphylococcus aureus bacteriostasis rate	肺炎克雷伯氏 菌抑菌率 (%) Klebsiella pneumoniae bacteriostasis rate
55dtex/36F	≥ 2.5	$18 \pm 3.0$	9 ± 3.0	$4\pm0.5$	99	98	99

### 应用技术

### **Application Technology**

**染前处理**:尽量降低碱的浓度,淡碱处理完后加强水洗,避免不必要的助剂使用,部分助剂可能会影响抑菌效果。

**Pre-dyeing treatment:** try to reduce the concentration of alkali, enhance washing after the treatment of light alkali to avoid unnecessary use of additives because some additives may affect the bacteriostatic effect.

**染色:** 注意不要染得太深,避免不必要的助剂使用,影响抑菌效果。助剂及染料越少对抑菌效果越好。

**Dyeing:** pay attention not to dye too deep and avoid unnecessary use of additives which may affect the bacteriostatic effect. The less additives and dyes, the more washing, the better the bacteriostatic effect.

## 纤维应用 Fiber Application

	服装用纺织品 Clothing textiles											
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater				
$\sqrt{}$	$\sqrt{}$			$\sqrt{}$								
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining				
$\sqrt{}$		$\sqrt{}$	$\sqrt{}$		$\sqrt{}$							
羽绒服 Down jacket	高端成衣 High-end ready- to-wear											
MODERNESS WHO SERVICES	家用纺织品 Home textiles											
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel							
$\sqrt{}$	$\sqrt{}$		$\sqrt{}$		$\sqrt{}$							
		产业	业用纺织品 In	dustrial textil	es							
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies				
$\sqrt{}$				$\sqrt{}$		$\sqrt{}$		$\sqrt{}$				
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine	面膜 Masks					

Q: 锌系抑菌聚酯纤维的抑菌原理是什么?

A:该纤维采用锌系抑菌。锌离子具有氧化还原性,当它和细菌细胞膜相结合时,与其中的有机物发生反应,破坏了膜蛋白结构,使其失去活性,达到杀菌的目的。当细菌被杀死后,锌离子又会从菌体中游离出来,再与其他细菌接触,完成新的杀菌任务,所以显出很强的杀菌活性。同时 Zn 也是人体所需元素,对人体无伤害。

目前该产品已与多家品牌商及企业合作,如 361°、恒安等。

#### Q: What is the bacteriostatic principle of zinc antibacterial PET fiber?

**A:** The fiber adopts zinc-based bacteriostatic. Zinc ion has redox property, and when it combines with bacterial cell membrane, it reacts with the organic substance in the membrane, destroying the membrane protein structure, making it inactive and achieving the goal of sterilization. When the bacteria are killed, zinc ions will be free from the bacteria, and then contact with other bacteria to complete the new sterilization task, showing a strong bactericidal activity. At the same time, Zn is also a necessary element for the human body with no harm to the human body.

At present, the product has cooperated with several brands and enterprises, such as  $361^\circ$ , Hengan and so on.



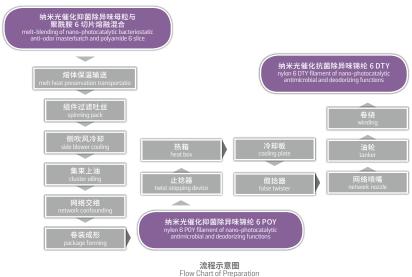
## 纳米光催化抑菌除异味 聚酰胺 6 纤维

# Nano-photocatalytic PA6 Fiber of Antibacterial and Deodorant **Functions**

#### 制备技术 **Processing Technology**

纳米光催化抑菌母粒与聚酰胺 6 切片熔融共混纺丝制备出具有 高效抑菌和除臭功能的聚酰胺 6 纤维。

Polyamide 6 fibers with high antimicrobial and deodorizing functions are prepared by melt-blending spinning of nano-photocatalytic antibacterial masterbatch and polyamide 6 slice.



## 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格

#### **Main Specifications**

长丝 Filament yarns 77.8dtex/24F、77.8dtex/48F

#### 标准及认证 Standards and Certifications

《锦纶牵伸丝》Nylon drawn yarn (GB/T 16603-2017) 《锦纶 6 预取向丝》Nylon 6 pre-oriented yarn (FZ/T 54024-2009) 《锦纶 6 弹力丝》Nylon 6 stretch yarn (FZ/T 54007-200)



纤维原貌图 Fibers in original appearance



纤维截面图 Fiber longitudinal section

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 吸湿快干、抑菌 Hygroscopic and fast-dry, bacteriostatic



• 消味除臭效果持久,不受洗涤次数或面料使用环境的限制 Durable deodorizing effect, and is not limited by times of washing or the environment in which the fabric is used





•强度高,耐磨性好

High strength, high wear resistance

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Extension at break	卷曲收缩率 (%) Crimp shrinkage rate	卷曲稳定性 (%) Crimp stability	热收缩率 (%) Heat shrinkage rate	染色均匀度 Uniformity in dyeing
77.8dtex/24F	4.47	25.3	52.8	64.3	5.41	4.5

白色念珠菌的抗菌率	金黄色葡萄球菌的抗菌率	大肠杆菌的抗菌率	氨气、醋酸、戊酸气味的
(%)	(%)	(%)	除臭效率 (%)
Candida albicans antibacterial	Staphylococcus aureus	Escherichia coli	Deodorization efficiency of ammonia,
ratio	antibacterial ratio	antibacterial ratio	acetic acid and valeric acid
≥ 92	≥ 99	≥ 93	

#### 应用技术 ●・・・・・

#### **Application Technology**

定型:精练除油后尽快进入预定型工序,定型温度不能过高,并要配合使用防黄助剂。 Setting: After refining and oil removal, go into the pre-set working procedure as soon as possible, the setting temperature can not be too high, and anti-yellow additives are used together.

后整理: 后整理尽量不使用强酸或含氯离子试剂。

**After-treatment:** Try not to use strong acid or chloride ion reagent in post-arrangement.



Q: 纳米光催化抑菌除异味聚酰胺 6 纤维具有抑菌作用,其作用是否由重金属离子获得? 该纤维是否对人体有害?

A: 纳米光催化抑菌除异味聚酰胺 6 纤维的抑菌作用通过添加纳米光催化材料获得。与其他抑菌方式相比,光催化抑菌不含有对身体可能产生不利影响的元素,且在太阳光照射下,催化技术重新激发,其抑菌、消味、除臭等功能可以不断重复,不受洗涤次数或面料使用环境的限制。

下游及终端合作品牌有爱慕、如吻等。

# Q: Nano-photocatalytic PA6 fiber of anti-bacterial and deodorant functions has bacteriostatic effect, whether the effect derived from heavy metal ions? Is the fiber harmful to humans?

**A:** The bacteriostatic effect of the nano-photocatalysis bacteriostatic anti-odor polyamide 6 fiber is obtained by adding nano-photocatalysis material. Compared with other bacteriostatic methods, the photocatalysis bacteriostatic method does not contain elements that may have adverse effects on the body, and the catalytic technology can be reactivated under sunlight. Its unique functions such as bacteriostatic and deodorizing can be repeated continuously without the limitation of washing times or the environment in which the fabric is used.

Downstream and terminal cooperation brands include Aimer and Kissy and son on.



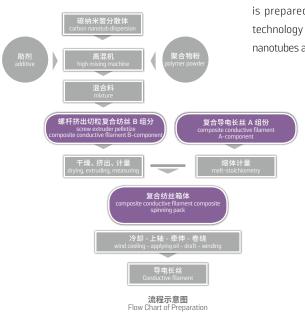
## 碳纳米管添加改性皮芯 复合导电聚酯纤维

# Sheath-core Conductive PET Fiber Modified with Carbon Nanotubes

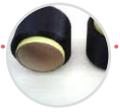
## 制备技术 Processing Technology

自主开发碳纳米管导电母粒,通过共混 改性,经熔融复合纺丝技术制备皮芯复 合导电聚酯纤维。

Carbon nanotubes conductive master batch is developed independently, and the sheath-core composite conductive polyester fiber is prepared by melt composite spinning technology through modification of carbon nanotubes addition.



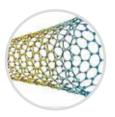
#### 



纤维原貌图 Fiber in original appearance



纤维截面图 Fiber longitudinal section



碳纳米管 Carbon nanotube



长丝 Filament yarns 176dtex/32F

#### 标准及认证 Standards and Certifications

《导电涤纶牵伸丝》 Conductive polyester drawn yarn (FZ/T54042-2011) 《涤纶低弹丝》 Polyester low stretch yarn (GB/T14460-2015) 通过 ISO 9001 认证 Certified by ISO 9001

#### 纤维性能与制品特点 Fiber Performance and Product Features



• 导电、抗静电功能优异 Excellent electrical conductivity and static resistance



• 易织造,面料蓬松、有起泡风格 Easy to weave, fabric with blister style

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Extension at break	高压电阻率 (Ω) High voltage resistivity	表面电阻 (Ω) Surface resistance	卷曲收缩率 (%) Crimp shrinkage rate	卷曲稳定性 (%) Crimpstability
176dtex/32F	3	30.5%	1.0*106 Ω	$10^4\Omega$	45	75



# 应用技术 ●・・・・・・・・・ Application Technology

混纺: 可与各种纤维长丝、纱线混并、交织。

**Blending:** It can be mixed and interwoven with various fiber filaments and yarns.

染色:建议采用阳离子及分散染料。

**Dyeing:** Cationic and disperse dyes are recommended.

#### 纤维应用

#### **Fiber Application**

		服	装用纺织品 C	lothing textil	es			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
		$\sqrt{}$					$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
	$\sqrt{}$							
		产业	业用纺织品 In	dustrial texti	les			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
				$\sqrt{}$				
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Putdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
1								



Q:碳纳米管添加改性皮芯复合导电聚酯纤维的特点和用途?

A:在织物中加入碳纳米管添加改性皮芯复合导电聚酯纤维,可以有效地消除静电。 其面料蓬松、透气、富有弹性,可与羊毛、棉、聚酯纤维、再生纤维素纤维等的纱线 合并,用于军工、医护、电子、石油化工等领域的工装及防护服。

Q: What are the characteristics and applications of sheath-core conductive PET fiber modified with carbon nanotubes?

**A:** Adding elastic conductive fiber into the fabric can effectively eliminate static electricity. The fabric is fluffy, breathable, elastic, and can be combined with wool, cotton, polyester, sticky, nitrile and other yarns for protection, tooling fabric and clothing in military industry, medical care, electronics, petrochemical and other fields.



## 中空异形再生纤维素纤维

# Regenerated Hollowshaped and Profiled Cellulose Fiber

#### 制备技术 Processing Technology

采用纺前二次注射技术,加入发泡剂和调节剂,经过动态、两道静态混合器充分混合均匀, 制得高质量复合纺丝原液,再经湿法纺丝工艺配合多级分配的牵伸工艺制备而成。

The high-quality composite spinning solution was firstly prepared by using the pre-spinning secondary injection technology, adding foaming agent and adjusting agent, and fully mixing and homogenizing in dynamic and two static mixers, then it is prepared by wet spinning process and multi-stage drafting process.



#### 纤维及制品特点

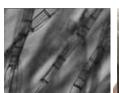
**Characteristics of Fiber and Product** 

#### 主要规格 Main Specifications

短纤维 Staple fibers 1.67dtex × 38mm



纤维原貌图 Fibers in original appearance



纤维电镜图 Fiber electron microscope figure

中国纤维流行趋势报告 2020/2021 CHINA FIBERS FASHION TRENDS REPORT



#### 标准及认证

#### **Standards and Certifications**

《粘胶短纤维》 Viscose staple fiber (GB/T 14463-2008)

《化学纤维异形度试验方法》Test method for chemical fiber profileness(FZ/T 50002-2013)

《中空异形再生纤维素纤维》 Regenerated hollow-shaped and profiled cellulose fiber (Q/GYH003-2018)

《一种吸色中空粘胶纤维的制备方法》A preparation method of color-absorbing hollow viscose fiber(CN2016111617697)

《一种竹节型中空竹粘胶纤维的制备方法》A preparation method of bamboo-type hollow bamboo viscose fiber(CN2016111627025)

通过 OEKO-TEX® STEP、FSC、ISO 9001、ISO 14001、OHSAS18001: 2007 认证 Passed OEKO-TEX® STEP, FSC, ISO 9001, ISO 14001, OHSAS18001: 2007 certification

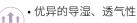
产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	湿断裂强度 (cN/dtex) Wet breaking tenacity	干断裂伸长 (%) Dry extension at break		中空度 (%) Hollowness	
$1.67 dtex \times 38 mm$	≥ 2.05	≥ 1.00	$19 \pm 3.0$	≥ 70	≥ 60	

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



纤维横截面为椭圆形中空状结构,蓬松性好
 The fiber cross section is elliptical hollow structure with good fluffiness

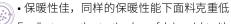


Excellent wet permeability and gas permeability



• 良好的抗静电、耐磨、抗起球性

Excellent anti-static, wear-resistant and anti-pilling performance



Excellent warmth retention, lower fabric weight with the same warmth retention property

定位	原料配比	支数	主要产品及特性
Positioning	Raw material ratio	count	Major products and characteristics
	中空 70%、柔丝 30%	40/1	家用纺织,柔软、舒适、保暖、吸湿排汗;可进行香味 整理
家纺 Home	70% hollow, 30% rose	40/1	Home textile, soft, comfortable, warm, moisture absorption and perspiration; can be carried out fragrance finishing.
textiles	中空 50%、壳聚糖 30%、柔丝 20% 50% hollow, 30% chitosan, 20% rose	32/1	家纺和抑菌保暖内衣、棉毛衫、女士内衣针织面料 Home textile and bacteriostatic warm underwear, cotton sweater, women's underwear knitted fabric.
运动	中空 40%、翡翠 30%、天丝 30% 40% hollow, 30% jade, 30% tencel	60/1	远红外、吸湿排汗中高档瑜伽服、运动服 Middle and high grade yoga clothes, sportswear, far infrared, moisture absorption and perspiration.
Sports	中空 40%、PTT30%、壳聚糖 30% 40% hollow, 30% PTT, 30% chitosan	60/1	抑菌、吸湿排汗中高档瑜伽服、运动服 Middle and high grade yoga clothes, sportswear, bacteriostatic, moisture absorption and perspiration. absorption and perspiration.
休闲	中空 40%、粘胶 30%、棉 30% 40% hollow, 30% viscose, 30% cotton	32/1	各类针织面料 Various knitted fabrics.
Relaxation	中空 35%、壳聚糖 35%、棉 30% 35% hollow, 35% chitosan, 30% cotton	21/1	抑菌、保暖、吸湿排汗牛仔服、T 恤面料 Jeans, T-shirt fabric, bacteriostatic, warm, moisture absorption and perspiration.
毛纺 Wool	中空 40%、防缩羊毛 30%、莫代尔 30% 40% hollow, 30% non-shrinkable wool, 30% modal	40/2	半精纺:休闲衬衣、休闲面料、针织面料 Semi-worsted: casual shirt, casual fabric, knitted fabric.
spinning	中空 40%、羊毛 30%、涤纶 30% 40% hollow, 30% cotton, 30% polyester	80/2	精纺:正装 Worsted: formal wear.
饰品 Accessories	中空 30%、防缩羊毛 20%、 柔丝 20%、壳聚糖 30% 30% hollow, 20% non-shrinkable wool, 20% rose, 30% chitosan	30/2	保暖、抗菌、可机洗毛衣、袜子、手套、围巾等 Warm, bacteriostatic, machine washable sweater, socks, gloves, scarves, etc.

#### 应用技术 ●・・・



#### **Application Technology**

混纺: 可以与棉、涤纶、差别化再生纤维素纤维及羊毛等进行混纺, 中空纤维使用配比 30%~70%。

**Blending:** It can be blended with cotton, polyester, differentiated regenerated cellulose fiber and wool etc., and the proportion of hollow fiber is 30% - 70%.

染色:建议采用阳离子及分散染料。

**Dyeing:** cationic and disperse dyes are recommended.

#### 纤维应用



#### **Fiber Application**

	服装用纺织品 Clothing textiles										
		/IX	2011 ST 11 S	lotilling textile	-5						
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater			
	$\sqrt{}$										
羽绒服 Down jacket	高端成衣 High-end ready- to-wear										
$\sqrt{}$											
			家用纺织品 b	ome textiles							
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel						
$\sqrt{}$				$\sqrt{}$	$\sqrt{}$			. ^			



Q: 该纤维生产过程中最大的技术特点和性能优点是什么?

A: 该纤维制备时, 在纺丝原液中添加了发泡剂, 当纺丝原液进入凝固浴中, 纺丝原液细 流中的发泡剂在纤维凝固成形时与凝固浴中的硫酸发生反应生成 CO2 气体溢出,从而在 纤维中形成许多微孔,赋予纤维疏松多孔的结构,进一步提高了纤维的吸湿、保暖性能。

O: 该纤维在下游产品开发中的应用优势是什么?

A:由于该纤维具有高吸收性、高膨体、密度低、覆盖力强的特点,因其特殊的横截面 和中空结构,能赋予织物非常奇特的手感。例如:中空异形再生纤维素纤维与涤纶混纺 的平纹机织衬衫,手感完全与棉一样,而在斜纹织物中又和羊毛手感一样。

#### Q: What are the remarkable technical features and performance advantages of the fiber production process?

A: During the preparation of the fiber, foaming agent is added to the spinning solution. When the spinning solution enters the coagulation bath, the foaming agent in the spinning stock solution flow reacts with the sulfuric acid in the coagulation bath during the fiber solidification to produce CO2 gas overflow, thus, many micropores are formed in the fiber, which gives the fiber a loose and porous structure and further improves the moisture absorption and warm retention properties of the fiber.

#### Q: What are the application advantages of this fiber in downstream product development?

A: Because of its high absorbency, high bulk, low density and strong coverage, the fiber can give the fabric a very peculiar feel due to its special cross-section and hollow structure. For example, a plainwoven shirt blended with regenerated hollow-shaped and profiled cellulose fiber and polyester has the same feel as cotton, and the same feel as wool in twill fabric.

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具体品种

**Specific Variety** 

• 抗熔滴永久阻燃聚酰胺纤维

• 地毯用阻燃聚酰胺 6 纤维

• 阻燃高强聚酰胺 66 纤维

• 阳燃高强聚酯工业丝

Flame-retardant PA6 Carpet Fiber (Bcf)

Flame-retardant and High-strength PA66 Fiber

Anti-dripping and Permanent Flame-retardant PA6 Fiber

Flame-retardant and High-strength Polyester Industrial Yarn

推荐理由

备等产业用领域广泛应用。

**Recommendation Reasons** 

纤维的阻燃性通过耐高温磷氮无机纳米复合阻燃、先进的无 卤无磷环保阻燃机理实现,品种从民用丝覆盖到工业丝,突 破燃烧时产生大量熔滴、烟雾毒性、"灯芯效应"、阻燃剂 高比例添加等难题,应用领域进一步延伸,在窗帘、地毯等 家用纺织品,汽车、高铁、航空座椅内饰、消防服及单兵装

fiber is realized based on the mechanism of high temperature resistant phosphorus-nitrogen-inorganic nanocomposite

phosphorus-free environment friendly flame-retardant. The variety covers from civil fiber to industrial fiber. It breaks through a lot of problems generated when burning such

proportion of flame retardant, leading to further extending application fields. The flame retardancy of the fiber is widely used in the fields of household textiles such as curtains, carpets, automobiles, high-speed rail, aviation chair interior,

# -lame-retardant Fiber



#### 纤维及制品特点 ●・・・・

#### **Characteristics of Fiber and Product**

#### 主要规格

#### **Main Specifications**

PA6、PA66: 1.65~2.22dtex × 38~130mm



纤维原貌图 Fibers in original appearance

#### 标准及认证

#### **Standards and Certifications**

《锦纶短纤维》Nylon stable fiber

(FZ/T 52002-2012)

《一种高可纺性无卤阻燃锦纶纤维的制备方法》

The preparation method of a high spinnability halogen free flame retardant nylon fiber (CN102653890B)

通过 ISO9001:2015、德国 TUV 认证

Passed ISO9001: 2015, German (TUV) certification

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 无卤阻燃、燃烧无熔滴、烟毒性小、无"灯芯效应" Halogen-free flame retardant, combustion without melting droplets, less smoke toxicity, no "wick effect"



强度高,可高比例混纺
 High strength, high proportion of blending



• 耐磨性好、热湿舒适性好

Good wear resistance, comfortable with regard to heat and humidity

产品规格 Product specification	Product specification Breaking tenacity		极限氧指数 LOI (%) Limiting oxygen index		
PA6-FR	3.0-4.0	50-80	>27		
PA66-FR	3.0-4.5	50-80	>29		

#### 应用技术 ●・・・・・

## **Application Technology**

**混纺:** 与其他纱线混纺使用,添加比例 30%~50% 为宜,视混纺纤维种类和比例的不同,最多可达到 60%~70%,但需要在提高抱合力方面做好工艺调整。

**Blending:** It is suitable to add 30% - 50% when blending with other yarns, and is up to 60% - 70% depending on the type and proportion of blended fiber, but we need to adjust the technology to improve the cohesive force.

染色: 本色是白色消光, 染整工序参考常规锦纶。

**Dyeing:** The natural color is matte white, and please refer to conventional nylon for its dyeing and finishing process.

#### 纤维应用



#### **Fiber Application**

	服装用纺织品 Clothing textiles										
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater			
		$\sqrt{}$					$\sqrt{}$				
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining			
羽绒服 Down jacket	高端成衣 High-end ready- to-wear										
	家用纺织品 Home textiles										
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel						
$\sqrt{}$		$\sqrt{}$									
		产业	业用纺织品 In	dustrial textil	les						
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies			
$\sqrt{}$											
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks				
$\sqrt{}$			$\sqrt{}$								
							$\bigcap$	Λ (			

Q: 抗熔滴永久阻燃聚酰胺纤维的优势及应用前景如何?

A:聚酰胺纤维一直是世界各国在制作作战服、战训服和工装上面的核心材料,然而在和热固性的芳纶、聚酰亚胺、阻燃粘胶等纤维的混纺纱里面总是出现"灯芯效应"而失去阻燃性。在和热固性二元和三元混纺纱里,高比添加阻燃聚酰胺纤维是可以大大延长面料耐久性的紧缺品种。

抗熔滴永久阻燃聚酰胺纤维突破了聚酰胺纤维在阻燃纤维混纺体系里面无法实现高比例添加问题,添加量可达 60%~70%,实现高性能阻燃面料的舒适与安全性。

# Q: What are the advantages and application prospects of anti-dripping and permanent flame-retardant PA fiber?

**A:** Nylon has been the core material in the combat uniforms, combat training uniforms and tooling all over the world. However, the "wick effect" always appears in the blended yarn with thermosetting materials such as aramid, polyimide and flame retardant viscose, thus losing the flame retardancy.

In thermosetting binary and ternary blended yarns, high ratio addition of flame-retardant nylon is a scarce variety that can greatly prolong the durability of fabrics.

Anti–dripping and permanent flame–retardant PA fiber breaks through the problem that polyamide fiber cannot be added in high proportion in the flame–retardant fiber blended system, the amount of addition can reach 60% - 70%, which realize the comfortable, safe and durable use of high-performance flame–retardant fabric.

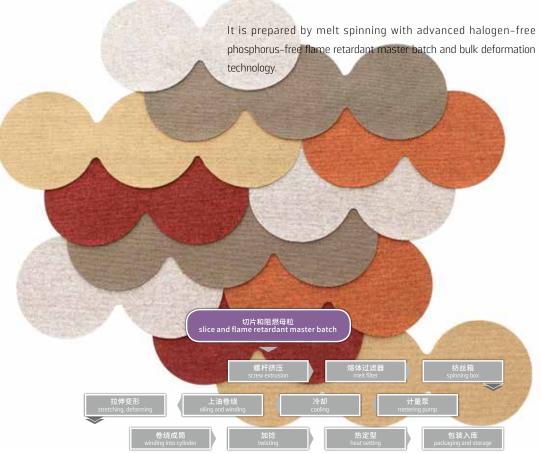


## 地毯用阻燃聚酰胺 6 纤维

Flame-retardant PA6 Carpet Fiber

## 制备技术 Processing Technology

添加先进的无卤无磷阻燃母粒,采用熔融纺丝和膨体变形技术制备。



流程示意图 Flow Chart of Preparation

## 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

长丝 Filament yarns 1110dtex/60F



《锦纶 6 膨体长丝》 Nylon 6 bulk filament (FZ/T 5408248-2015)

《环保型阻燃涤纶膨体变形丝纱线及制备方法》

Environment friendly flame retardant polyester bulk deformed silk yarn and preparation method (ZL2011104317093)

• 无卤阻燃,本身不发生火焰燃烧,离开火焰后,



纤维原貌图 Fiber in original appearance



纤维截面图 Fiher in section



#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



自行熄灭,燃烧不产生有害气体,低烟低毒 Halogen-free phosphorus-free flame retardant, no flame combustion itself, self-extinguishing after leaving flame, does not produce harmful gas in combustion,



low smoke and low toxicity

•强度高、耐磨性好

High-strength, good wear resistance

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Elongation at break	沸水收缩率 (%) Crimp shrinkage	热卷曲 (%) Crimp stabilly	极限氧指数 (%) Limiting oxygen index (%)	回潮率 (%) Moisture regain
1110dtex/60F	2.6	30.14	8.76	43.6	>32	3.92

#### 应用技术

#### **Application Technology**

染整: 染整工艺参考常规聚酰胺 6 纤维产品, 更易上色。

**Dyeing and finishing:** Please refer to conventional nylon products for dyeing and finishing process, it is easier to color.

it is casici to color.

后整理: 无需阻燃涂层处理。

After-treatment: No flame-retardant coating treatment is required.



Q: 地毯用阻燃聚酰胺 6 纤维与其它同类产品相比,优势体现在哪里,应用推广如何? A: 该纤维采用的阻燃体系为环保型无卤阻燃。与国内航空地毯现行的卤素阻燃锦纶材料相比,燃烧过程中不产生窒息性的有毒卤化氢气体;与磷系阻燃材料相比,燃烧发烟量少且不污染水源;阻燃聚酰胺纤维密度比现行的羊毛航空地毯密度轻,对航空载荷有效率至关重要。目前国际上飞机客舱内部材料一般采用经过阻燃涂覆、抗静电、抗菌处理的羊毛纤维或皮革,但随着客舱纺织品洗涤次数的增加,其效果逐渐减弱,因此民航飞机上的座椅面罩或门帘经过急促洗涤后不再使用。本纤维具有永久本征阻燃及抑菌特性,能有效阻止与降低火灾风险,保护客机人员的安全和健康。

# Q: Compared with other similar products, what are the advantages of flame-retardant PAS carpet fiber and how about its application promoting?

**A:** The flame-retardant system of the fiber is environment-friendly, halogen-free and phosphorus-free flame retardant. Compared with the current halogen flame retardant nylon materials used in the domestic aviation carpet, no asphyxiating toxic hydrogen halide gas is produced in the combustion process; compared with the phosphorus flame retardant material, the combustion smoke is less and does not pollute the water source; the density of flame retardant polyamide fiber is lighter than that of current wool aerial carpet, which is very important for the efficiency of aerial load.

At present, the internal materials used in the cabin of international planes are generally wool fibers or leather which have been treated with flame retardant coating, antistatic and antibacterial treatment, but with the increase of the washing times of the cabin textile, its effect gradually weakens, therefore, the seat cover or door curtain on civil aviation aircraft is no longer in use after several times of washing. This product has permanent intrinsic flame–retardant and bacteriostatic characteristics, and can effectively prevent and reduce fire risk, protect the safety and health of passenger aircraft personnel.



## 阻燃高强聚酰胺 66 纤维

# Flame-retardant and High-strength PA66 Fiber

#### 制备技术 Processing Technology

通过添加氮磷无机纳米复合阻燃母粒,采用 共混改性技术,经熔融纺丝工艺制备。

It is prepared by melt spinning process with nitrogen-phosphorus inorganic nanocomposite flame retardant master batch and blending modification technology.

| PAGE 17 | PAGE 17 | PAGE 17 | PAGE 17 | PAGE 18 | PAGE 17 | PAGE 18 | PAGE 1

#### 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

长丝 Filament yarns 110~700dtex/36~108F 工业丝 Industrial yarn 940dtex/144F



纤维原貌图 Fibers in original appearance

#### 标准及认证

#### **Standards and Certifications**

《锦纶 66 工业用长丝》Nylon 66 industrial filament (Fz/t 54013-2009) 通过 OEKO-TEX 100、iso9001、iso14001、iso18001 认证 Passed 0EKO-TEX 100, iso9001, iso14001, iso18001 certification

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**





• 无卤低烟阻燃,强度高

Halogen free low smoke flame retardant, high strength





• 耐高低温、耐摩擦、耐疲劳

High and low temperature resistance, friction resistance, fatigue resistance



• 耐腐蚀性能佳,不霉不怕蛀,有耐碱的能力,但不耐酸和氧化剂 Excellent corrosion resistance, does not mildew and is not afraid of moth, possesses ability to resist alkali but not acid and oxidizing agent resistant

产品规格 Product specification	纤度 (dtex) Fineness	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Extension at break	(%)	极限氧指数 (%) Limiting oxygen index	含油率 (%) Oil content	回潮率 (%) Moisture regain
13.3dtex/5F	112	6.36	25 ± 5	$5.0 \pm 1.0$	≥ 33	0.8±0.4	4.5

#### 应用技术



#### **Application Technology**

混纺: 可与各种纤维纱线混并, 混纺性好。

Blending: It can be with all kinds of fiber yarns with good blendability.

**后整理:**无需化工助剂阻燃后整理,环保无污染。

**After-treatment:** No chemical additives are needed for flame-retardant after-treatment, which is environment-friendly and pollution-free.



#### 纤维应用



产业用纺织品 Industrial textiles								
汽车内饰 utomotive inner decoration	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 cleaning supplies
$\sqrt{}$			$\sqrt{}$					
军用纺织品 Military textiles	特种纸 Special paper	户外用品 Outdoor product	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Mask	
$\sqrt{}$			$\sqrt{}$					

O: 阻燃高强聚酰胺 66 长丝相比常规聚酰胺 66 长丝, 性能优越在哪里?

A:常规聚酰胺长丝的极限氧指数只有24%左右,并且在燃烧过程中产生熔滴,属于易燃材料,使用过程中易引发火灾。阻燃高强聚酰胺66长丝极限氧指数能达到34%,无需用化工助剂阻燃后整理,环保无污染,混纺性好,且纤维固有的可染性、耐磨性等常规性能不下降。已普遍用于汽车、高铁等领域。

# Q: What are the advantages of flame-retardant and high-strength PA66 filament over conventional nylon filament?

**A:** The limiting oxygen index of ordinary nylon is only about 24% and melting droplets can be produced during the combustion process and it is a flammable material that can cause fire easily during the process. The limiting oxygen index of flame retardant high-strength polyamide 66 filament can reach 34%, and no chemical additives are needed for flame retardant after-treatment. It is environment friendly and pollution-free with good blendability, and the inherent dyeability and abrasion resistance and other conventional properties of the fiber are not reduced. It has been widely used in automobile, high-speed railway and other fields.



## 阻燃高强聚酯工业丝

Flame-retardant and High-strength Polyester Industrial Yarn

## 制备技术 Processing Technology

采用有机 / 无机复配的耐温型磷系聚酯阻燃母粒,通过共混添加的方法,调整纺丝温度、挤出速率、冷却拉伸形变与应力分配,进行熔融纺丝制得。

It adopts the organic / inorganic compound temperature – resistant phosphorous polyester flame–retardant master batch, and adjusts the spinning temperature, extrusion rate, cooling tensile deformation and stress distribution by means of blending addition, and then is prepared by melt spinning.





#### 

#### 主要规格 Main Specifications

长丝 Filament yarns 1100~1670dtex/192F、2200~3300dtex/384F

#### 标准及认证 Standards and Certifications

《涤纶工业长丝》 Polyester industrial filament (GBT16604-2008)

《一种阻燃型涤纶工业长丝及其生产工艺》 A flame-retardant polyester industrial filament and its

(ZL200810301416.1)

production technology

纤维性能与制品特点 Fiber Performance and Product Features





•良好的比强度、尺寸稳定性、柔韧性、耐环境性,在安全防护产品的轻量 化方面优势突出

Good specific strength, dimensional stability, flexibility, environmental resistance, outstanding advantages in lightweight safety protection products

		FD 140 11 // 4		77 lbb — 11 // 0				
产品规格	高强工业丝 High-strength industrial	阻燃工业丝 1 Flame retardant	阻燃工业丝 2 Flame retardant	阻燃工业丝 3 Flame retardant				
Product specification	yarn	industrial yarn	industrial yarn	industrial yarn				
	以 1100dtex/192F 为例 Take 1100dtex/192F as an example							
断裂强度 (cN/dtex) Breaking tenacity	8.5 ± 0.2	$8.0 \pm 0.2$	$7.8 \pm 0.2$	$7.8 \pm 0.2$				
断裂伸长 (%) Elongation at break	14 ± 2	14 ± 2	$14 \pm 2$	15 ± 2				
干热收缩率 (%) Dry-hot shrinkage	$6.8 \pm 0.2$	$8.6 \pm 0.2$	$8.6 \pm 0.2$	$8.8 \pm 0.2$				
P 含量 (ppm) P content (ppm)	0	$3000 \pm 100$	$3900 \pm 100$	$4800 \pm 100$				
LOI 值 LOI value	$20 \pm 0.5$	$29 \pm 0.5$	$30 \pm 0.5$	$31 \pm 0.5$				
UL-94	NF	V-2	V-2	V-0				
MSD 最大烟密度 MSD maximum smoke density	95	93	93	87				
SDR 烟密度等级 SDR smoke density rating	79	78	70	64				

阻燃高强聚酯工业丝 Flame-retardant and high-strength polyester industrial yarn



阻燃高强聚酯加捻丝 Flame-retardant and highstrength polyester twisted yarn



阻燃高强聚酯工业帆布 Flame-retardant high-strength polyester industrial canvas



## 应用技术

## **Application Technology**

燃烧后残留样品比较(从左向右阻燃母粒依次增加)) Pictures of length of combustion residues (flame retardant master batch addition increased successively from left to right)

**后整理:**工序中添加的胶液、助剂需要具有一定阻燃性,否则会影响产品阻燃性能。

**After-treatment:** The glue and additives added in the after-treatment process need to have a certain flame retardancy, otherwise it will affect the flame retardancy of the product.

#### 纤维应用

#### **Fiber Application**

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
		$\sqrt{}$					$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
			$\sqrt{}$	$\sqrt{}$				
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
			家用纺织品 H	ome textiles				
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$					
		لاعتر	业用纺织品 In	dustrial textil	es			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
$\sqrt{}$							$\sqrt{}$	
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
$\sqrt{}$			$\sqrt{}$			$\sqrt{}$		



Q: 阻燃高强聚酯工业丝市场导向性及认可度如何?

A:原阻燃高强聚酯工业丝市场供货紧缺,以低强度(6.5 cN/dtex 左右)的产品为主,限制了产品的推广应用。浙江尤夫开发的拉伸强度是 7.5cN/dtex 以上的阻燃聚酯工业丝,已初步得到部分客户认可。

Q: What about the market orientation and recognition of flame-retardant and highstrength polyester industrial yarn?

**A:** The market supply of flame-retardant and high-strength polyester industrial yarn is in shortage, mainly low-strength (about 6.5 cN/dtex) products, limiting the promotion and application of the products. The flame-retardant polyester industrial yarn with the tensile strength over 7.5cN/dtex developed by Zhejiang UNIFULL has been initially recognized by some customers.



#### 推荐理由

纤维以百变的身姿,隐匿在你不曾察觉的领域,默默守护着你。采用静电纺丝、驻极熔喷纺丝、膜膨化技术,构建微纳梯度结构、气凝胶结构,助力聚酰亚胺、聚丙烯腈、聚丙烯纤维在口罩滤芯、防护服上的应用;具有亲肤、抑菌、高吸湿等性能、且可生物降解的海藻纤维在口罩内层、医用敷料、止血急救材料、绷带等领域大放异彩,为消费者筑起安全屏障。

#### **Recommendation Reasons**

Fiber hides in the unperceived fields with its diverse postures and guards you silently. The electrostatic spinning, electret melt–blow spinning and membrane expansion technology are adopted to construct micro–nano gradient structure, aerogel structure, assisting the application of polyimide, polyacrylonitrile and polypropylene fiber on mask filter core and protective suit; The alginate fiber with such as skin–friendly, bacteriostatic, highly hygroscopic and biodegradable properties, yields brilliant achievements in fields such as mask inlayer, medical dressings, hemostatic first–aid supply and bandages, and builds a safety barrier for consumers.

#### 具体品种 Specific Variety

- 静电纺聚酰亚胺纳米纤维气凝胶膜 Polyimide Nanofiber Aerogel Membrane by Electrospinning
- 静电纺聚丙烯腈纳米纤维 Electrospinning Polyacrylonitrile Nanofiber
- 熔喷驻极聚丙烯微纳纤维
   Melt-blow Electret Polypropylene Nanofiber
- 海藻纤维 Alginate Fiber



## 静电纺聚酰亚胺纳米纤维 气凝胶膜

# Polyimide Nanofiber Aerogel Membrane by Electrospinning

## 制备技术 Processing Technology

先合成分子链段刚柔不同的两种共聚聚酰胺酸,并配置成两种适于 静电纺丝的纺丝液,采用静电纺丝工艺,制成由不同粗细纳米纤维 组成的聚酰胺酸膜,最后经去溶剂、粘合、纤维亚胺化、定型、膜 膨化等热处理加工,制成孔率达到 95-98% 的气凝胶膜。

Firstly, two kinds of copolymerized acid with different rigidity and flexibility of molecular chain segment are synthesized, and then two kinds of spinning solution are prepared, which are suitable for electrostatic spinning. Secondly, polyaminoacid membrane of different sizes of nanofibers are prepared by electrostatic spinning. Finally, the aerogel membrane with a porosity of 95–98% is prepared by heat treatment such as solvent removal, adhesion, fiber imidization, shaping and membrane expansion.



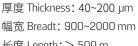
#### 纤维及制品特点



#### **Characteristics of Fiber and Product**









#### 标准及认证 Standards and Certifications

《电纺聚酰亚胺纳米纤维气凝胶》 Electrospinning polyimide nanofiber aerogel (O/PI001-2020)

and long service life



成卷的膜 Coiled membrane

#### 纤维性能与制品特点 **Fiber Performance and Product Features**



• 过滤效率高, 比表面积大, 透气性好、具有静电吸附性能 High filtering efficiency, large specific surface area, electrostatic charge, good permeability





•强度高、耐磨擦、耐水煮水洗,使用寿命长 High strength, abrasion resistance, water boiling – resistant and washing – resistant





• 耐高低温、耐化学溶剂、耐辐照、生物相容性好 High and low temperature resistance, chemical solvent resistance, radiation resistance and good biocompatibility





• 本质阻燃, 导热系数低具有保暖效果

Flame retardant, low thermal conductivity with thermal insulation effect

产品 Product	厚度 (µm) Thicknes	密度 (g/cm³) Density	孔隙率 (%) Porosity	细菌过滤效 率 (%) Bacterial filtration efficienc	0.3 μ m 颗粒 拦截效率 (%) Interception efficiency of 0.3μm particles	气流阻力 (Pa) Airflow resistance	极限氧指数 (%) Limit oxygen index
静电纺聚酰亚胺纳米纤维 气凝胶膜 -40 Electrostatic spinning polyimide nanofiber aerogel membrane -40	40	0.08-0.12	> 93	> 99.9	> 95.0	< 180	44
静电纺聚酰亚胺纳米纤维 气凝胶膜 -75 Electrostatic spinning polyimide nanofiber aerogel membrane -75	75	0.08-0.12	> 93	> 99.9	> 95.0	< 200	44
静电纺聚酰亚胺纳米纤维 气凝胶膜 -100 Electrostatic spinning polyimide nanofiber aerogel membrane -100	100	0.08-0.12	> 93	> 99.9	99.99	< 250	44
静电纺聚酰亚胺纳米纤维 气凝胶膜 -200 Electrostatic spinning polyimide nanofiber aerogel membrane -200	200	0.08-0.12	> 93	> 99.9	99.99	< 320	44

静电纺聚酰亚胺纳米纤维气凝胶膜性能参数

erformance parameter of polyimide nanofiber aerogel membrane by electrostatic spinning

#### 

#### **Application Technology**

**染色:**本征亮黄色,可染红、绿、蓝、黑等色,建议染色温度、 热定型温度不超过 200℃。

**Dyeing:** It is bright yellow and can be dyed into different colors including red, green, blue and black and so on, It suggests dyeing temperature and heat setting temperature shall not exceeding 200 °C.





#### 纤维应用 ●・・・ Fiber Application

休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater	
		$\sqrt{}$							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining	
$\sqrt{}$									
羽绒服 Down jacket	高端成衣 High-end ready- to-wear								
$\sqrt{}$									
	产业用纺织品 Industrial textiles								

	产业用纺织品 Industrial textiles									
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies		
$\sqrt{}$	$\sqrt{}$			$\sqrt{}$	$\sqrt{}$	$\sqrt{}$				
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks			
./		,_		./						

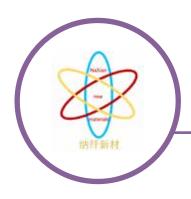


Q: 静电纺聚酰亚胺纳米纤维气凝胶膜在医疗卫生领域的应用价值如何?

A:该产品生物相容性好、无溶剂和金属催化剂残留、无异味、固有静电压高、孔隙率高、耐水洗,非常适合用来制造口罩、防护性服装等医疗卫生用品。更重要的是具有优异的耐候性,在任何极端天气环境下可长期存放,性能不衰减,是制备长期存储医疗战备物资的最佳材料。

Q: What about the applications of polyimide nanofiber aerogel membrane by electrostatic spinning in medical and health?

**A:** The product does well in biocompatibility, and is solvent-free and metal catalyst residue-free, besides, it has high inherent static voltage, high porosity, and is washable without odor. Thus, it is perfect for manufacturing masks, protective suites and other medical and health supplies. More importantly, it has excellent weather resistance, and can be stored in any extreme weather for a long time without decline in performance. It is the best material for preparing medical supplies for combat readiness which can be stored for a long time.



## 静电纺聚丙烯腈纳米纤维

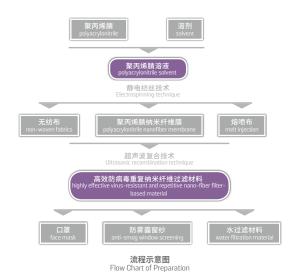
# Electrospinning Polyacrylonitrile Nanofiber

## 制备技术

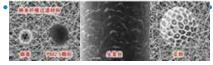
#### **Processing Technology**

将聚丙烯腈溶于溶剂中,室温搅拌约 12 h,制备成均匀稳定的聚丙烯腈溶液,再采用印刷式模块化静电纺丝技术,制备聚丙烯腈纳米纤维膜。

The polyacrylonitrile was dissolved in a solvent and stirred at room temperature for about 12 hours to prepare a stable polyacrylonitrile solution, and then the polyacrylonitrile nanofiber membrane was prepared by 3D-printed modular electrospinning technique.



# 纤维及制品特点 ●・・・・・・・・・・・・・・・Characteristics of Fiber and Product



#### 主要规格

#### **Main Specifications**

纤维的微观图片 A microscopic picture of the fiber

静电纺聚丙烯腈纳米纤维:直径80~150nm

Electrospinning polyacrylonitrile nanofiber: the diameter is 80–150nm

静电纺聚丙烯腈纳米纤维膜:克重为 3g/m²

Electrospinning polyacrylonitrile nanofiber membrane: the gram weight is 3g/m<sup>2</sup>

产品规格 Product specification 横向断裂强度 (MPa) Horizontal breaking tena		纵向断裂强度 (MPa) Longitudinal breaking tenacity	抗渗水性 (Kpa) Resistance to water penetration	表面抗湿性 Surface humidity resistance	
静电纺聚丙烯腈纳米纤维膜 Electrospinning polyacrylonitrile nanofibers membrane	22	25	50	水接触角 30° Water contact angle of 30°	

#### 标准及认证

#### Standards and Certifications

《呼吸防护用品——自吸过滤式防颗粒物呼吸器》

Respiratory protective equipment – Self–inhalation filter respirator against particulate matter (GB2626-2006)

《一种多喷头组合式喷气静电纺丝机》

The invention relates to a multi-nozzle combined air-jet electrostatic spinning setup  $(ZL\ 201310101604.0)$ 

#### 纤维性能与制品特点

#### Fiber Performance and Product Features

纤维超细,制成的产品轻薄透气,过滤精度高: 纳米纤维的粗细仅为头发丝千分之一,由 其制成的口罩芯层厚度不超过 3 微米,过滤精度小于 0.1 微米,可以高效拦截飞沫、PM2.5、 细菌和病毒等,对非油性过滤效率≥ 96%;透气性好,呼吸顺畅(吸气阻力为常规 N95 型 防护口罩的三分之一)。

The fiber is super fine, and the product made from which is thin and breathable, with high filtration precision: The thickness of the nanofiber is only one thousandth of a hair, the thickness of the mask core layer made from which is not less than 3 microns, and the filtration precision is less than 0.1 microns. It can effectively intercept foam, PM2.5, bacteria and virus, and exhibits a non-oil filtering efficiency of 96% or more; It exhibits good air permeability and hence, ensure smooth inhalation (the inspiratory resistance is one third of that of the normal N95 protective mask).

性能稳定,可重复使用: 纳米纤维膜仅依靠物理拦截,几乎能够百分之百过滤细菌和病毒;经酒精处理后在对非油性过滤效率89%~93%;经沸水处理后对非油性过滤效率90%~93%,防护性能保持较好,可循环使用至少3次,经济实惠。

It is stable and reusable: The nanofiltration membrane can filter out bacteria and viruses almost 100% by only physical interception; and the filtration efficiency for non-oil is 89%–93% after alcohol treatment; 90% – 93% filtration efficiency for non-oil after boiling water treatment. It can maintain good protective performance, and can be recycled at least 3 times, which is economical and practical.

#### 纳米纤维口罩与常规口罩性能对比表

Performance comparison of nanofiber mask and conventional mask

酒精处理 Alcohol treatment		.口罩 nal masks	聚丙烯腈纳米纤维口罩 Polyacrylonitrile nanofiber mask		
	滤效 (%) Filtration efficiency			滤阻 (Pa) Filtration resistance	
处理前 Pre-treatment	97.12	256	99.86	170	
处理后 Post-treatment	40.67	264	95.98	178	

#### 应用技术 ●・・・・・



#### **Application Technology**

**应用:**按照所需比例对静电纺纳米级聚丙烯腈纤维膜进行剪裁,剪裁后即可用于指定用途, 如口罩生产、水过滤材料。

Application: The electrostatic spinning nano-scale polyacrylonitrile membrane was tailored according to the required proportion and then it can be used for the specified purposes, such as masks production and water filtration materials.

#### 纤维应用 •••



#### **Fiber Application**

	产业用纺织品 Industrial textiles							
汽车内饰 utomotive inner decoration	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 cleaning supplies
				$\sqrt{}$	$\sqrt{}$			
军用纺织品 Military textiles	特种纸 Special paper	户外用品 outdoor product	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Mask	口罩 Face mask
								$\sqrt{}$

Q: 采用静电纺聚丙烯腈纳米纤维膜制备的口罩滤芯, 其特点是什么?

A:基于静电纺丝技术,开发出具有自主知识产权的气流辅助静电纺丝宏量化生产设备, 利用该设备生产的聚丙烯腈纳米纤维,与传统静电纺丝技术相比,纤维直径降低了2-3 倍,过滤效率更高。之后将聚丙烯腈纳米纤维膜与传统熔喷无纺布进行复合,构建了一 种具有梯度结构的高效低阻口罩滤芯,在保证了过滤精度和效率的情况下,减小呼吸阻力, 保证了舒适性。该滤芯完全依靠物理吸附和拦截,没有经过驻极,因此其防护效果受酒 精喷洒、水分和湿度影响较小,可重复使用3次左右,经济实惠。

#### Q: What are the characteristics of the mask filter element prepared by electrostatic spinning polyacrylonitrile nanofiber membrane?

A: Based on the electrospinning technique, an air-flow assisted electrospinning macro-quantitative production equipment with independent intellectual property rights has been developed. Compared with the traditional electrospinning technology, the polyacrylonitrile nanofibers produced by this equipment are 2-3 times smaller in diameter and even higher in filtration efficiency. Then, a highly efficient and low resistance mask filter element with gradient structure was constructed by compounding the polyacrylonitrile nanofiber membrane with the traditional melt-blown nonwoven fabric to reduce the respiratory resistance and ensure comfortability while sustaining the filtering accuracy and efficiency. The filter element completely depends on physical adsorption and interception, without electret, therefore, its protective effect is less affected by alcohol spraying, moisture and humidity. It can be reused about 3 times, which is very economical and practical.



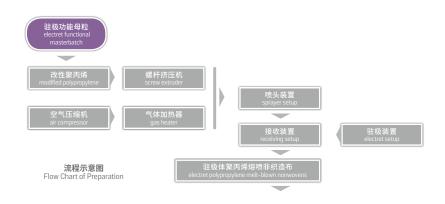
### 熔喷驻极聚丙烯微纳纤维

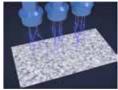
# Melt-blow Electret Polypropylene Nanofiber

## 制备技术 Processing Technology

以改性聚丙烯为主体材料,添加少量驻极功能母粒,采用熔喷纺丝和驻极工艺,制备出具有永久静电吸附特性的聚丙烯微纳纤维交叠的非织造布。

The protocol is based on modified polypropylene as the main material by adding a small amount of electret functional masterbatch, via the utilization of melt-blown spinning and electret process in realization of polypropylene micro-nanofiber overlapping nonwovens with permanent electrostatic adsorption characteristics.





**驻极处理** The so-called "Electret treatment"



通过静电原理,飞沫被牢牢吸附在熔喷布上 The droplets are firmly adsorbed on the melt-blown nonwovens through the electrostatic principle

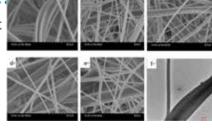
#### 纤维及制品特点



#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

微米级纤维: 直径 2~10 μ m Micron fiber: Diameter 2 - 10 μm 纳米级纤维: 直径 150~1000nm Nano fiber: Diameter 150 - 1000nm



不同微纳结构的熔喷非织造材料的 SEM 图和 TEM 图 The SEM and TEM images of melt-blown nonwovens with a variety of micro- and nano- structures

熔喷非织造布: 克重为  $10\sim100g/m^2$ ,纤网中约 40% 纤维直径小于 1000nm,最小直径可达 150nm,同时约 20% 的纤维直径大于  $6\mu$  m。

**Melt-blown nonwovens:** the gram weight is  $10-100g/m^2$ ; the diameter of 40% fiber in the fiber web is less than 1000 nm, with the minimum diameter of 150 nm, while the diameter of 40% fiber is larger than 6  $\mu$ m.

#### 标准及认证

#### Standards and Certifications

《医用口罩用材料性能的标准规范》 Standard specification for performance of materials used in medical masks (ASTM F2100-2019)

《日常防护型口罩技术规范》 Technical Specification for daily protective respirator (GB/T 32610-2016)

《医用外科口罩》Medical surgical Mask (YY 0469-2011)

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**

微米级粗纤维起到"骨架"支撑作用,改善纤网孔隙结构;纳米级细纤维发挥"小尺度"效应赋予其特殊表面特性,结合驻极功能母粒添加和电晕放电技术,使产品满足日常防护型口罩、医用外科口罩、KN95、KN99以及 HEPA 滤布的应用需求。

Micron-scale coarse fiber acts as the supporting role just like "skeleton" to improve the pore structure of fiber mesh; The nano-scale fine fiber gives its special surface characteristics by exerting "small scale" effect, by taking advantages of electret function masterbatch addition and corona discharge technology, which can meet the application requirements of daily protective mask, medical surgical mask, KN 95, KN 99 and HEPA filter cloth.

产品规格 Specifications	克重 (g/m²) Gram weight	滤布过滤效率 (%) Filtration efficiency of the filter cloth	过滤阻力 (Pa) Filtration resistance	横向断裂强度 (N/5cm) Horizontal breaking tenacity	纵向断裂强度 (N/5cm) Longitudinal breaking tenacity
熔喷驻极聚丙烯微纳纤维 非织造布 <sup>1</sup> Melt-blown electret polypropylene polypropylene micro-nanofiber nonwovens <sup>1</sup>	25	≥ 95	≤ 25	≥ 8	≥10
熔喷驻极聚丙烯微纳纤维 非织造布 <sup>2</sup> Melt-blown electret polypropylene polypropylene micro-nanofiber nonwovens <sup>2</sup>	50	≥ 99	≤ 100	≥8	≥10

注 Note: 1 过滤效率测试条件,测试流量 32L/min, 0.26 微米 NaCl 气溶胶 The test condition for filtration efficiency: A test flow of rate 32 L/min and 0.26-micron NaCl aerosol 2 过滤效率测试条件,测试流量 85L/min, 0.26 微米 NaCl 气溶胶 The test condition for filtration efficiency: A test flow of rate 85 L/min and 0.26-micron NaCl aerosol

#### 应用技术

#### **Application Technology**

**应用:** 不需要染整加工,可按照口罩类型进行裁剪,通过自动化口罩机与纺粘非织造布进行复合生产。也可以与纺粘非织造复合,制作高效过滤器过滤材料。与二层纺粘非织造布热粘复合生产 SMS,制作一次性防护服,再复合透气膜(PE、PU 和 PTFE)制作医用隔离服。 **Application:** It does not require dyeing and finishing, and can be customized according to the type of mask and can be jointly produced through the automatic mask machine and spunbonded nonwovens. It can also be combined with spunbonded non-woven to produce filtration materials with high efficiencies. It can be combined with bi-layered spunbonded nonwovens to produce SMS, and can also be combined with gas-permeable membrane (PE, PU and PTFE) to produce medical insulating suite.



Q:熔喷驻极聚丙烯微纳纤维非织造布制备技术的特点及优势是什么?

A:采用一步法构建微/纳纤维的多级结构,通过两种尺度优势的结合,在保证高精度过滤效果的情况下,显著提高纤网力学性能,展现出优异的综合性能。该技术在保持熔喷工艺生产效率的基础上,解决了"纳米纤维批量制备"的难题,有助于纳米纤维规模化应用推广。

Q: What are the characteristics and major advantages of fabrication technology of meltblown electret polypropylene micro-nanofiber nonwovens?

**A:** It adopts one-step method to construct the multi-stage structure of micro- and nano- fiber. By combining the advantages of two scales, the mechanical properties of the fiber web can be significantly improved and the comprehensive properties are displayed in the case of ensuring high precision filtering effect. Based on maintaining the efficiency of melt-blown process, the problem of "batch preparation of nanofibers" is successfully solved, which is helpful upon large-scale applications.



#### 海藻纤维

# Alginate Fiber

### 制备技术 Processing Technology

以海洋中蕴含量巨大、丰富可再生的海藻为原料,经溶解、分离、过滤等工序制备出纤维级海藻酸钠,再以海藻酸钠为原料经湿法纺丝工艺,通过多级牵伸制得的满足力学性能要求的海藻纤维。

The fiber sodium alginate is prepared from abundant and renewable marine algae through dissolution, separation and filtration, and then the alginate fiber that meets mechanical properties is prepared by wet–spinning process with sodium alginate as raw material through multi–stage drafting.



中国纤维流行趋势报告 2020/2021 CHINA FIBERS FASHION TRENDS REPORT

#### 纤维及制品特点



#### 主要规格

#### **Main Specifications**

短纤 Staple fiber: 1.24~5.5dtex × 38mm

#### 标准及认证 Standards and Certifications

《海藻酸盐短纤维》Alginate staple fiber (FZ/T 52049-2018) 《海藻酸盐短纤维》Alginate staple fiber (HX/T 51005-2014) 《纤维用褐藻酸钠》Sodium alginate for fiber (HX/T 51014-2016)





• 生物基原料,资源可再生。纤维可自然降解,不对环境造成危害,符合环保要求 Biological base material with renewable resources. The fiber can be naturally degraded without harming the environment, which is in line with the requirements of environmental protection



•回潮率高 15%~18% (棉为 9%,羊绒为 15%~20%),舒适度接近羊绒,媲美高档长绒棉,有着极好的手感和穿着舒适性

High moisture regain with 15% - 18% (9% for cotton and 15% - 20% for cashmere), it is nearly as comfortable as cashmere and can be on a par with high-end long stapled cotton, which has excellent hand feelinglt is comfortable to wear.



- 抑菌性能优良,对白色念珠菌、金黄色葡萄球菌、大肠杆菌抑菌率高 Excellent bacteriostatic performance, high bacteriostatic rate to candida albicans, staphylococcus aureus and colon bacillus
- 防霉性能优良,防霉等级 0 级 Excellent mold proof performance with the mold proof grade of 0



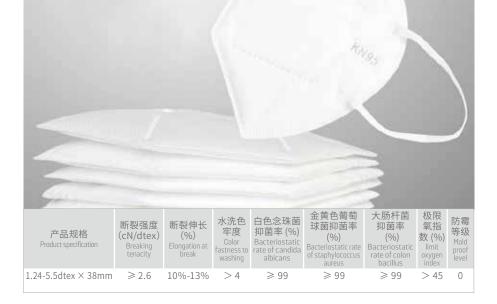
• 本质阻燃,极限氧指数 LOI > 45%,遇火直接碳化,不产生有毒气体 It is flame retardant, and the limit oxygen index is more than 45%. It carbonized directly in case of fire with no toxic gas produced



• 具有高吸收性、可形成凝胶、可生物降解,能够止血及促进伤口愈合,可加速血液凝固和结痂速率

Highly absorbent, can form gel, biodegradable, be able to stop bleeding and promote wound healing, and can speed up the rate of blood clotting and scarring





#### 应用技术

## Application Technology

混纺:建议与其他混纺纤维混合后并条,混纺比例最好不高于30%。

**Blending:** It is suggested to mix with other blended fibers before drawing with the blending ratio not higher than 30%.

洗涤: 在洗涤过程中, 尽量使用中性洗涤剂。

Washing: Neutral detergent should be used as much as possible during the washing process.

**应用:**整个工艺流程中应避免接触钠离子及碱性环境,温度最好不要超过80度。生物酶可能会对海藻纤维造成伤害,因生物酶种类繁多,建议先做小试。

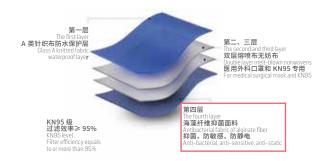
**Application:** Sodium ions and alkaline environment should be avoided in the whole process, and the temperature should not exceed 80 degrees. Biological enzyme may cause harm to the alginate fiber, it is recommended that a small test is first to be done because of the variety of biological enzyme.

#### 纤维应用



#### **Fiber Application**

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$		$\sqrt{}$		$\sqrt{}$			$\sqrt{}$	$\sqrt{}$
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
$\sqrt{}$	$\sqrt{}$					$\sqrt{}$		$\sqrt{}$
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
	$\sqrt{}$							
			家用纺织品 H	lome textiles				
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
		$\sqrt{}$	$\sqrt{}$		$\sqrt{}$			
		产业	L用纺织品 In	dustrial textil	les			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies
				$\sqrt{}$			$\sqrt{}$	
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	口罩 Face mask
$\sqrt{}$			$\sqrt{}$					$\sqrt{}$



Q: 为什么海藻纤维是医疗包扎用品的理想材料? 原理是什么?

A: 纤维的表面含有钙离子和钠离子,钙离子可与伤口渗出液的钠离子进行离子交换。 钙离子进入伤口,钠离子进入纤维的分子链。由于海藻酸钠溶于水,纤维发生较大 溶胀形成凝胶,从而为伤口愈合创造了湿润的环境,同时对新生的娇嫩组织起到保 护作用,防止在去除纱布时造成二次创伤,可用于医用敷料、止血急救材料、绷带等、 手术后护理材料等。

Q: Why is alginate fiber an ideal material for medical dressings? How does it work?

**A:** The surface of the fiber contains calcium ions and sodium ions. Calcium ions can be exchanged with sodium ions of wound exudate. Calcium ions enter the wound and sodium ions enter the molecular chains of the fibers. As sodium alginate dissolves in water, the fibers swell to form a gel, which creates a moist environment for wound healing. And at the same time, it protects the newly formed delicate tissue from secondary trauma during gauze removal. It can be used for medical dressing, hemostatic first-aid material, bandage, post-operation nursing material, etc.

Q:该纤维是否已投入用于口罩生产(N95级)中,介绍在口罩领域的应用情况?

A:海藻纤维目前已在 KN95 级口罩生产中应用。医用口罩由三层组成,最外层是无纺布,第二层是过滤层,最里层一般是纺粘无纺布。海藻纤维口罩主要是替代最里层的无纺布,具有亲肤、吸湿等特点。目前海尔、恒尼智造等多家口罩企业生产 KN95 海藻纤维医用口罩,并发往包括湖北在内的多个省市,支持新冠疫情防控。Q: Has the fiber been used in mask production (N 95 level)? Please introduce its application in face masks

**A:** Alginate fiber is currently used in the production of KN95 masks. Medical mask consists of three layers. The outer layer is non-woven fabric, the second layer is a filter layer and the inner layer is generally spunbonded non-woven fabric. Alginate fiber mask is mainly to replace the innermost layer of non-woven fabric, which is skin-friendly, hygroscopic and so on. At present, KN95 alginate fiber medical masks are being produced by Haier, Honny Zhizao and other mask enterprises, and are being sent to many provinces and cities, including Hubei Province, to support the prevention and control of the COVID-19.



## Stylish Design

至尚追求,成就卓越。细微之处见真章,轻柔纤维的匠心展现在折过不留痕"的纤旦微轻,展现在"润肤细无声"的体贴入微。弹性纤维的品质体现在"一动一静"的收放自如中,塑造贴身舒适感,创享新功能体验趋势。以多一分则溢,少一分则亏的严谨彰显细微之处的精确控制。

The pursuit of quality results in excellence. True quality can be observed from subtleties, just as the craftsmanship of light and soft fiber is shown in the soft fine denier with 'no wrinkle after folding', and in the considerate design featuring "unconscious touch to the skin". The quality of elastic fiber is embodied in its excellent flexibility and ultimate comfort, creating the trend of new functional experience. It manifests its precise control of details with a perfect precise attitude.

FIBER



#### 推荐理由

创新共聚改性和纺丝工艺,开发出单丝纤度细、亲肤柔和、质轻垂感、光泽好、生产效率高的轻柔纤维,完美演绎了"折过不留痕"的纤旦微轻以及"润肤细无声"的体贴入微。应用领域升级到婚纱、高端成衣定制。

#### **Recommendation Reasons**

dyeable at low-temperature and one-step ATY technology. The development of a soft fiber with fine fineness monofilament, gentle skin, light weight, draping and good luster is a perfect interpretation of the "folding without leaving a trace" of the light denier and considerate "moisten the skin silently". The application domain upgrades to the wedding dress and the highend ready-to-wear custom.

## Soft Fiber 努柔纤维

#### 具体品种 Specific Variety

- 高仿真丝聚酯纤维
- High-imitated-silk PET Fiber
- 常压阳离子改性多孔细旦聚酯纤维

Cationic Easy-dyeing Modified Porous Fine-denier Polyester

- •一步法多孔细旦聚酰胺 6 纤维
- Multiporous Fine-denier PA6 Fiber Using One Step Method
- 细旦聚丙烯腈长丝

Fine-denier Polyacrylonitrile Filament



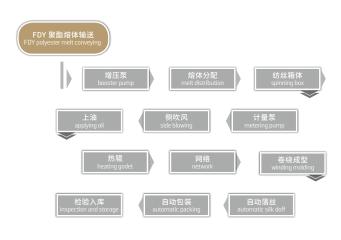
#### 高仿真丝聚酯纤维

## High-imitated-silk PET Fiber

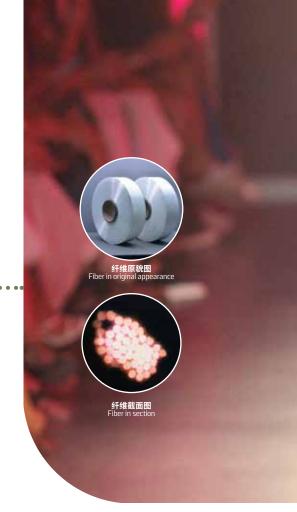
#### 制备技术 Processing Technology

在熔体直纺生产线上采用 iBOX 卷绕设备,添加自行研制的高抗静电油剂制备而成。

iBOX winding equipment was used in melt direct spinning production line, and it is prepared by adding high antistatic oil agent.



流程示意图 Flow Chart of Preparation



#### 

#### 主要规格 Main Specifications

长丝 Filament yarns 40dtex/48F (FDY)

#### 标准及认证 Standards and Certifications

《涤纶牵伸丝》Polyester drawn yarn (GB/T8960-2015)

#### 纤维性能与制品特点 Fiber Performance and Product Features



• 细旦、高仿真丝、光泽好 Fine denier, high imitation silk, good luster



• 其面料织品紧密、细洁光滑、平挺美观 The fabric is tight, fine clean, smooth and beautiful

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Elongation at break	线密度偏差率 (%) Elongation at break in dry state	含油率 (%) Oil content	沸水率 (%) Shrinkage in boiling water
40dtex/48F	≥ 3.5	$32 \pm 2.0$	40 ± 2.0	$1.20 \pm 0.20$	7.60±0.3

## 应用技术 ●········· Application Technology

**织造:** 建议与真丝熟丝合股复捻,采用平纹组织,织造紧密塔夫绸。

**Weaving:** It is suggested to stranding and folded twist with silk and boiled-off silk with plain weave to weave tight taffeta.





#### Q: 该产品的最大性能优势和应用亮点在哪里?

A: 该纤维可与真丝熟丝合股复捻,以平纹为地组织,生产织品中最紧密的塔夫绸。 塔夫绸生产工艺复杂,产量不多,难得名贵,但折皱后易产生永久性折痕,本产品加 入合股复捻制成织物后,有效改善了折损的问题。

### Q: What are the biggest performance advantages and application highlights of this product?

**A:** The fiber can be folded twisted by stranding silk and boiled-off silk with plain weave to produce taffeta, the most compact of all fabrics. The production technology of taffeta is complex with little output. It is rare and expensive, and is easy to produce permanent crease after folding. This product has effectively improved the damage problem after adding the compound twist into the fabric.



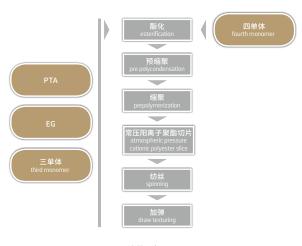
#### 常压阳离子改性多孔细旦 聚酯纤维

## Cationic Easy-dyeing Modified Porous Finedenier Polyester

#### 制备技术 Processing Technology

采用共聚改性(引入第三单体,第四单体)和异形截面纺 丝技术,经熔融纺丝工艺制备。

Using copolymerization modification (introducing the third monomer, the fourth monomer) and profiled cross-section spinning technology, it was prepared by melt spinning process.



流程示意图 Flow Chart of Preparation

#### 纤维及制品特点

#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

长丝 Filament yarns 55-167dtex/36-144F

#### 标准及认证 Standards and Certifications

《弹性涤纶牵伸丝》Elastic polyester drawn yarn (FZ/T 54069-2015) 通过 OEKO-TEX Standard 100 认证 Passed OEKO-TEX Standard 100 certification



纤维原貌图 Fiber in original appearanc



纤维截面图 Fibor in soction

#### 纤维性能与制品特点 Fiber Performance and Product Features



• 细旦,质轻 Fine denier, lightweight



• 染色温度低,96℃染色即可达到饱和值、上染率高、色牢度高、色泽鲜艳 Low dyeing temperature, the saturation value can be reached by dyeing at 96°C, high dyeing rate, high color fastness, bright color



• 回潮率高于常规聚酯 (0.4%)、亲水性强、吸湿排汗 Moisture regain rate is higher than conventional polyester (0.4%), Strong hydrophilicity, moisture absorption and perspiration

产品规格 Product specification	83dtex/72F
断裂强度 (cN/dtex) Breaking tenacity	2.9
断裂伸长率 (%) Extension at break	30.78
回潮率 (%) Moisture regain	0.79
96℃常压下染色上染率 (%) Dyeing rate under atmospheric pressure at 96°C	≥ 92
耐日晒牢度 (级) Sun-light fastness (grade)	3
耐皂洗色牢度(级) Color fastness to soaping (grade)	4-5
干摩色牢度(级) Color fastness to dry rubbing (grade)	4-5
湿摩色牢度(级) Color fastness to wet rubbing (grade)	4-5
染色饱和值 Dyeing saturation value	3.7

## 应用技术 •••••••• Application Technology

**染色工艺:** 推荐阳离子染料, 染料添加量要低于纤维的染色饱和值

**Recommended dyeing process:** cationic dyes, dye content is lower than the dyeing saturation of fiber

**除油剂:** 1g/LpH: 4~5

Oil removing agent: 1g/LpH: 4-5

**染色温度:** 96℃ \*40min (该纤维在 96℃便能够实现完全染色,上染率达 99% 以上)

**Dyeing temperature:** 96°C \*40 min (the fiber can achieve complete dyeing at 96°C with a dyeing rate of over 99%)

**定型工艺:** 170°C \*1min,比常规聚酯低 20°C左右 **Sizing process:** 170°C \*1 min, about 20°C lower than conventional polyester



## 纤维应用 •••• Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$			$\sqrt{}$				$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
$\sqrt{}$						$\sqrt{}$		
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							

#### Q: 常压阳离子改性多孔细旦聚酯纤维的竞争优势如何?

A:首先,就染色成本而言,常压阳离子改性多孔细旦聚酯纤维由于染色温度低,无需高压,每吨染色节约能源成本约 400 元左右。其次,常压阳离子改性多孔细旦聚酯纤维与染料分子结合度更高,染色后脚水清澈,可实现脚水的回用。最后,该纤维的吸湿回潮率明显优于常规聚酯,模量也明显低于常规聚酯,做成的产品的品质更佳。

#### Q: What are the competitive advantages of cationic easy-dyeing modified porous finedenier polyester?

**A:** First of all, as far as the dyeing cost is concerned, the atmospheric pressure cationic modified porous fine denier polyester fiber needs no high pressure because of its low dyeing temperature, and can save the energy cost of about 400 yuan per ton. Secondly, the atmospheric pressure cationic modified porous fine denier polyester fiber has a higher degree of adhesion with dye molecules, and the dye water is clear after dyeing, which can realize the reuse of dye water. Finally, the moisture absorption and moisture regain of the fiber is obviously better than that of the conventional polyester, and the modulus is also obviously lower than that of the conventional polyester, which makes better product quality.



Multiporous Fine-denier PA6 Fiber Using One Step Method

#### 制备技术 Processing Technology

Huading

采用单螺杆、多头纺、多位数熔融纺丝技术,通过工艺创新,实现从 POY 到 ATY 的一步法生产,提高了生产效率。

Using single screw, multi-headed spinning, multi-digit melt spinning technology, the one-step production from POY to ATY is realized through process innovation, and the production efficiency is improved.



流程示意图 Flow Chart of Preparation

## 纤维及制品特点 ●•••••••••••••Characteristics of Fiber and Product

#### 主要规格 Main Specifications

长丝 Filament yarns 44dtex/48F(ATY)

#### 标准及认证 Standards and Certifications

《涤纶 (锦纶 )/ 氨纶包覆丝》 Polyester (nylon)/spandex covered silk (FZ/T12040-2013) 生态认证遵循 OEKO-TEX Standard 100 Ecological certification follows 0EK0-TEX Standard 100



纤维原貌图 Fiber in original appearance



#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 总纤度低、单丝纤度细 Low total fineness, fine fineness monofilament



• 织物轻薄柔软,具有棉的手感和较好的吸湿排汗效果 The fabric is light and soft, with cotton feel and good moisture absorption and perspiration effect

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂强度变异系数 (%) Variable coefficient of breaking tenacity	断裂伸长 (%) Extension at break	断裂伸长率变异系数 (%) Variable coefficient of extension at break	(%)	含油率 (%) Oil contentr
40dtex/48F	3.15	2.26	29.7	3.0	9.6	3.63

#### 应用技术 ●・・・・・・ Application Technology

**织造:**适用于纬编、经编和喷织。由于产品总纤度较小,且细旦多孔,使用时建议降低退绕车速,控制退绕张力的均匀性,稍稍降低整经及织造速度,以避免造成断头,影响运转

**Weaving:** Suitable for weft knitting, warp knitting and jet weaving. It is suggested to reduce the speed of unwinding, control the uniformity of unwinding tension, and slightly reduce the speed of warping and weaving to avoid breaking ends and influence the running efficiency because the total fineness of the product is low and the fine denier is porous.



Q:一步法多孔细旦聚酰胺 6 纤维的优势及市场前景如何?

A:传统聚酰胺 6ATY 采用两步法,先将 POY 通过牵伸制备成 FDY,再由 FDY 加弹制备而成。本产品则是直接由 POY 制备成 ATY,提高了生产效率和速度。

目前国内鲜有量产 70D 以下的锦纶 ATY 产品,该纤维制成的织物轻薄,且具有较好的吸湿排汗性能、柔软的手感,具有极好的仿棉的舒适性和美观的视觉外观,用其织成的塔丝隆面料,性能优越、经济实用,是一种理想的短纤维面料的替代品,户外运动面料正在大批量使用。该产品将引导国内纺织、服装等下游客户系列产品升级,市场认可度将不断提高,前景十分广阔。

## Q: What are the advantages and market prospects of multiporous fine-denier PA6 fiber using one step method?

**A:** The traditional polyamide 6ATY is prepared by two-step method, firstly, POY is prepared into FDY by drafting, and then it is prepared by draw texturing of FDY. This product will be prepared directly from POY into ATY to improve the efficiency and speed of production.

At present, there are few domestic production of nylon ATY products below 70D. The fabrics made of this fiber is lightweight, with good moisture absorption and perspiration, soft feeling, excellent cotton–like comfort and beautiful visual appearance. Taslon fabric woven from it is of superior performance, economic and practical, and is an ideal substitute for short staple fiber fabric. It is being widely used in outdoor sports fabric. This product will guide the domestic textile, clothing and other downstream customer series product upgrade, so its market recognition will continue to improve, and the prospects are very promising.



#### 细旦聚丙烯腈长丝

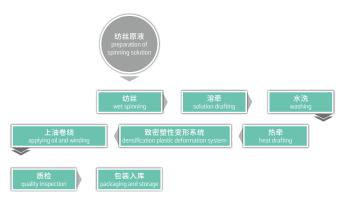
## Fine-denier Polyacrylonitrile Filament

#### 制备技术

#### **Processing Technology**

采用单喷单帽旋转纺丝技术,通过工艺创新,实现了腈纶 长丝的生产,提高了生产效率。

The single-jet and single-cap rotary spinning technology was adopted. Through technological innovation, the production of acrylic filament is realized and the production efficiency is improved.



流程示意图 Flow Chart of Preparation

## 纤维及制品特点 ••••••••• Characteristics of Fiber and Product

#### 独特的树皮状形貌 Unique bark-like morphology

#### 主要规格 Main Specifications

长丝 Filament yarns 167dtex/160F、83dtex/82F

#### 标准及认证 Standards and Certifications

《聚丙烯腈长丝》polyacrylonitrile filament (T/CCFA 01027-2017) 通过 ISO 9001 认证 Passed ISO 9001 certification

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 独特的树皮状表面形貌、抗老化性能好 Unique bark-like surface morphology, good anti-aging performance



• 蚕丝般的光泽、染色性好、吸湿透气 Silk-like luster, good dyeability, moisture absorption and breathable





手感柔软滑爽、垂感好、贴肤舒适Soft and smooth feeling, good sagging, comfortable to skin



• 不易皱、防霉防蛀、易洗快干

Wrinkle free, anti-mildew and moth-proof, easy to clean and quick-dry

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) elongation at break	沸水收缩率 (%) Boiling water shrinkage rate	染色均匀度(级) Uniformity in dyeing (grade)
167 dtex /160F	≥ 3.37	12.4	12.1	4-5

#### 应用技术

#### **Application Technology**

**染色:**建议采用阳离子染料,常温常压下正常染色。注意升温速率以及染色保温时间。 **Dyeing:** It is recommended to use cationic dye, or dyeing under ambient pressure and at ambient temperature. Pay attention to heating rate and dyeing time.



#### 纤维应用



#### **Fiber Application**

		服	装用纺织品 C	lothing textile					
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater	
	$\sqrt{}$		$\sqrt{}$					$\sqrt{}$	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining	
		$\sqrt{}$				$\sqrt{}$		$\sqrt{}$	
羽绒服 Down jacket	高端成衣 High-end ready- to-wear								
	$\sqrt{}$								
			中国体况日本						
家用纺织品 Home textiles									
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel				
			$\sqrt{}$						

#### Q: 开发细旦聚丙烯腈长丝的难点是什么? 其意义在哪里?

A:细旦聚丙烯腈长丝生产关键技术包括旋转纺丝技术、阶梯式分级水洗技术、蒸汽浴高倍牵伸技术,热管致密化干燥技术等,是一个系统集成技术,需要工艺条件的精密控制和设计,且研发专用设备,以保证高品质高稳定性生产。

该产品目前已完全实现量产,国内唯一生产企业,整体技术国际领先。其产品可满足下游高端纺织品对纤维原料的需求,极大地丰富了聚丙烯腈纤维的应用领域,在行业中具有示范和引领作用。

#### Q: What are the difficulties in developing fine-denier acrylic filaments? What's the point?

**A:** The key technologies in the production of fine denier polyacrylonitrile filament include rotary spinning technology, step-by-step washing technology, steam bath high-multiplier drafting technology, heat pipe densification drying technology, etc., it is a systematic integration technology that requires precise control and careful design of processing conditions. Also needs to tailor made equipment to ensure high quality and stable production.

At present, the product has fully realized mass production. As the only domestic production enterprise, its overall technology takes lead in the world. The quality of the products meet the demand of downstream high-end textile users. This technology greatly expands the application scope of polyacrylonitrile fiber, which is a successful demonstration and plays a leading role in the industry.

# Elastic Fibe

#### 推荐理由

氨纶在给予消费者"一动一静"、收放自如的同时,实现产品升级。打造高弹、高回复性、超舒适性、塑身感、贴身感的牛仔专用氨纶,解决了牛仔水洗后,裤缝容易失弹滑弹问题;结合以天然植物驱避剂、天然香料为主的微胶囊,赋予氨纶香味和驱蚊效果。

#### **Recommendation Reasons**

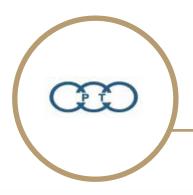
Spandex textiles are comfortable to wear no matter the consumers are moving or are steady, which achieves good product upgrading.

This Denim Spandex offers high-elasticity, high-recovery property, super-comfort, body-shaping, and close-fitting feeling, solves the problem that Denim seam is easy to lose elasticity after washing; Combined with the microcapsules containing natural plant repellent agent and natural fragrance, this Spandex product has nice fragrance aroma and mosquito-repellent effect.

#### 具体品种 Specific Variety

- 牛仔用高弹性氨纶
- High-elastic Spandex for Denim
- 缓释型芳香驱蚊氨纶

Sustained-release Mosquito Repellent Scented Spandex



#### 牛仔用高弹性氨纶

## High-elastic Spandex for Denim





纤维原貌图 Fiber in original appearance

#### 

#### 主要规格 Main Specifications

长丝 filament yarns 20~140D



《氨纶长丝》 spandex filament yarns (FZ/T54010-2006)

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**





• 高强度耐拉伸,增加了包芯过程中的可纺性,改善断头率 High strength and tensile resistance increases spinnability during core cladding and improves breakage rate



• 耐酸、耐碱、耐高温,保证加工环节中面料的可塑性 Acid resistance, alkali resistance and high temperature endurance ensure the plasticity of the fabric



• 成品保持了牛仔的高弹、高回复性,同时又有超舒适性、塑身感、贴身感 The finished product maintains the high elasticity and high resilience of the denim, and meanwhile has super comfort, body shaping and close-fitting feelings

规格	强度	(cN/dtex) Tenacity		6 应力 (cN) 00% stress	300% 弹性回复率 (%) 300% elastic recovery rate		
Specification	PT Stretch	行业标准 The industry standard	PT Stretch	行业标准 The industry standard	PT Stretch	行业标准 The industry standard	
20D	≥ 1.35	≥ 0.7	≥ 0.35	≥ 0.15	≥ 95	≥ 90	
30D	≥ 1.30	≥ 0.7	≥ 0.30	≥ 0.15	≥ 95	≥ 90	
40D	≥ 1.30	≥ 0.7	≥ 0.35	≥ 0.15	≥ 95	≥ 90	
70D	≥ 1.25	≥ 0.7	≥ 0.25	≥ 0.15	≥ 95	≥ 90	
105D	≥ 1.05	≥ 0.7	≥ 0.20	≥ 0.15	≥ 95	≥ 90	
140D	≥ 0.75	≥ 0.7	≥ 0.20	≥ 0.15	≥ 95	≥ 90	



纤维截面图

#### 应用技术 •

#### **Application Technology**

**染色:** 推荐使用同一批号卷装大小相同、生产日期相近的氨纶丝,以防出现布面弹力不匀, 染色色条等情况。

**Dyeing:** It is recommended to use the same batch with the same size and similar production date of spandex yarn to prevent uneven elasticity of the cloth surface and dyeing color stripes.

**拉伸:** 理想使用拉伸比是 2.5~3.5。

Drawing: The ideal draw ratio is 2.5 to 3.5.

**温度:** 织物染色温度≤ 120°C (< 1.5h),干式定型温度< 195°C (30S~90S),湿定型温度 ≤ 125°C (< 30S,不能有牵伸)。

**Temperature:** Fabric dyeing temperature  $\le 120^{\circ}\text{C}$  (<1.5h), dry setting temperature  $\le 195^{\circ}\text{C}$  (30S–90S), wet setting temperature  $\le 125^{\circ}\text{C}$  ( $\le 30\text{S}$ , no draft).

**漂白:** 推荐使用还原漂白剂,与棉交织物,尽量少用碱,常压下用双氧水、过硼酸钠、保险粉类来漂白(漂白时间<45min,pH约10.5~12.0),如需特白,可在漂白之后用荧光增白剂。

**Bleaching:** It is recommended to use reducing bleaching agent for bleaching process. For cotton interweaved fabrics, use as little alkali as possible, and bleach with hydrogen peroxide, sodium perborate, sodium hydrosulfite under normal pressure (bleaching time < 45min, pH approx. 10.5 - 12.0). For extreme white, fluorescent whitening agent can be used after bleaching.



#### O: 牛仔用高弹氨纶的市场应用价值?

A:采用德国巴斯夫公司的特殊 PolyTHF® 原料生产出的牛仔专用氨纶,具有高弹、高回复性,可以解决及改善牛仔水洗后,裤缝容易失弹、滑弹的问题。

#### Q: What is the market application value of highly elastic spandex for denim?

**A:** The special spandex for denim produced from the special PolyTHF® raw material of BASF in Germany displays high elasticity and high resilience, which can solve and improve the problem that jeans seam is easy to lose elasticity after washing.



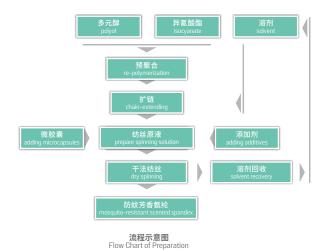
#### 缓释型芳香驱蚊氨纶

## Sustained-release Mosquito Repellent Scented Spandex

#### 制备技术 Processing Technology

在干法纺氨纶生产工艺基础上,加入以天然植物驱避剂、天然香料为主的微胶囊,微胶囊内药物缓释,赋予氨纶香味和驱蚊效果。

Microcapsules containing natural plant repellent agent and natural fragrance was incorporated on the dry spinning process of spandex. The pesticide in microcapsules was released slowly to give spandex fragrance and repellent effect.



#### 纤维及制品特点



#### **Characteristics of Fiber and Product**

#### 主要规格 Main Specifications

15~140D

#### 标准及认证 Standards and Certifications

《氨纶长丝》 Spandex filament yarns (FZ/T 54010-2006) 通过 OEKO-TEX 100、ISO 9001、ISO 14001 认证 Passed OEKO-TEX 100, ISO 9001, ISO 14001 certification



纤维原貌图 Fiber in original appearance



纤维截面图 Fiber in section

产品规格 Product specification	断裂强度 (cN/dtex) Breaking tenacity	断裂伸长率 (%) Elongation at break	300% 应力 ( cN/dtex ) stress	300% 弹性回复率 (%) 300% elastic recovery rate	留香率 (%) Fragrance retention rate
44dtex/3F	0.7~1.5	400~900	0.15~0.45	96.1	自然条件下放置 6 个月留 香率≥ 80% Fragrance retention rate under natural conditions for 6

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**



• 兼具氨纶的优势和驱蚊、持续留香等功能,

驱避率 70% 以上,达到 A 级

It has the advantages of spandex and functions of mosquito repellent, and continuous fragrance retention. The repellency rate is above 70%, reaching grade A.



•对皮肤无刺激、无过敏,多次洗涤后仍能持续保持均一性

No irritation or allergies to the skin, can maintain uniformity after repeated washing.

#### 应用技术



#### **Application Technology**

**染色和整理:** 参照常规氨纶面料的染色和整理工艺。

**Dyeing and finishing:** refer to the dyeing and finishing process of conventional spandex fabrics.





#### 纤维应用

#### **Fiber Application**

		服	装用纺织品 C	lothing textile	is			
休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
$\sqrt{}$	$\sqrt{}$							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
		$\sqrt{}$						
羽绒服 Down jacket	高端成衣 High-end ready- to-wear							
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel			
	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$					
		لا <del>خار</del>	业用纺织品 in	dustrial textil	es			
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Xleaning supplies
军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies					$\wedge$
√ 								

#### Q:纤维制备技术中的微胶囊添加技术的优势及特点?

A: 微胶囊是利用适当的壁材将具有特殊性能的芯材完全包覆起形成的微小囊球体,囊内芯材在纤维制备过程中能够保持相对"独立性"。将其添加在纺丝原液中,能够让微胶囊与纤维结合在一起,在纤维内外均匀分布,与通过后整理的同类产品相比,其性能更均一、持久。

#### Q: 天然植物香料驱蚊、蝇的原理?

A: 天然植物驱避剂、天然香料属于植物次生代谢物,主要成分含有萜、烯、酯、醇、酮、醛等物质,此类物质易挥发,对生物基体能够产生危害,因此,当蚊、蝇等嗅到该味道后,会自行避开,由于是微量缓释对人体无害。

## Q: What are the advantage and features of microcapsule addition technology in fiber preparation?

**A:** Microcapsule is a microcapsule sphere formed by completely covering the core material with special wall materials with appropriate properties. The core material inside the capsule can maintain relative "independence" in the fiber preparation process. Adding it to the spinning solution enables the microcapsules to be combined with the fibers, which are evenly distributed inside and outside the fibers. Compared with similar products after finishing, its performance is more uniform and durable.

#### 0: What is the principle of natural plant fragrances to repel mosquitoes and flies?

**A:** Natural plant repellents and natural fragrances are secondary metabolites of plants, mainly composed of terpene, alkene, ester, alcohol, ketone, aldehyde and other substances, which are volatile and can cause harm to the biological matrix. Therefore, mosquitoes, flies, etc. will avoid when smellingthem, and they are harmless to human bodybecause it is released slowly with small amount



## Top Manufacture

革故铸新,科技致创。高性能纤维挑战自我,升级时代担当,以"岿然"之势助力先进制造。高性能纤维与终端精准对接,高模高强、耐高温、防切割、抗腐蚀等优异性能为产品开发提供"支撑实力",在安全防护、风电叶片、压力容器、航空航天等极端应用领域中体现卓越价值,撑起"国之重器"。

Revolution and innovation are made in science and technology. High-performance fiber rises to challenges to upgrade into the leader of the era and assist advanced manufacturing with steady power. High-performance fiber has precisely connected with terminals, enabling excellent performance such as high modulus, high strength, resistance to high temperature, cutting and corrosion, to provide 'supporting strength' to product development. It has also demonstrated outstanding value in security protection, wind turbine blades, pressure vessels, aerospace and other extreme applications, giving full play to its role as 'a pillar of the nation'.

FIBER

#### 推荐理由

碳纤维突破干喷湿法纺丝、高品质低成本制备技术与装备, 并在丝束形状、表面处理及上浆等方面进行了专业优化,突 破新应用领域;易染聚酰亚胺纤维经过优化分子结构,方便 染料分子进入纤维,解决了传统聚酰亚胺纤维后道难染的难 题。高性能化学纤维以坚韧之躯,撑起"国之重器"。

#### **Recommendation Reasons**

This technology is a breakthrough dry-jet wet spinning technology for high-quality and low-cost carbon fiber production. The carbon fiber was optimized in terms of shape controlling of the tow, surface treatment and sizing techniques, which expand the new application field. The easy-dyeing polyimide fiber has been optimized facilitating dye molecules to enter the fiber, which overcomes the difficult dyeing problem of the traditional polyimide fiber. High-performance chemical fiber becomes the "national treasure" with its tenacious efforts.

#### 具体品种 Specific Variety

- QM4035 高强高模碳纤维 Qm4035 High Strength and High Modulus Carbon Fiber
- SYM40 高强高模碳纤维 Sym40 High Strength and High Modulus Carbon Fiber
- 压力容器用 HF30F 碳纤维 HF30F Carbon Fiber for Pressure Vessels
- 易染聚酰亚胺纤维 Dyeable Polyimide Fiber



#### 高强高模碳纤维

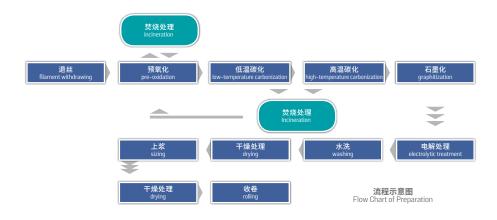
## High Strength and High Modulus Carbon Fiber

#### 制备技术 Processing Technology

**QM4035 高强高模碳纤维:** 采用湿法纺丝制备技术,通过超高温石墨化,制备出含碳量大于 99% 的高强高模碳纤维。

**SYM40 高强高模碳纤维:** 采用干喷湿法工艺制备出原丝,随后采用超高温石墨化技术实现纤维高模化,然后采用深度表面处理技术,提高纤维表面活性。

**QM4035** high strength and high modulus carbon fiber: By using wet spinning technology, high strength and high modulus carbon fiber with carbon content greater than 99% can be prepared through ultra-high temperature graphitization. **SYM40** high strength and high modulus carbon fiber: High modulus carbon fiber is prepared by dry jet wet spinning precursor. Carbonization and discontinuous graphitization processing technology were developed. High strength and medium modulus carbon fiber was prepared, and then the high strength and high modulus graphite fiber is prepared by ultra-high temperature graphitization technology.



#### 纤维及制品特点 ••••••

#### **Characteristics of Fiber and Product**

#### 主要规格

#### **Main Specifications**

QM4035-6K、QM4035-12K、SYM40-12K



纤维原貌图 Fiber in original appearance

#### 标准及认证

#### **Standards and Certifications**

《聚丙烯腈基碳纤维》 polyacrylonitrile-based carbon fibers (GB/T 26752-2011)

《制备大丝束碳纤维的预氧化方法》

The method of pre-oxidation for preparing big tows of carbon fibers (发明专利 CN201610517888.5)

《一种高取向度、高细旦化聚丙烯腈基碳纤维原丝的凝固成型方法》

Solidification molding method of high-orientation, high-fine denie polyacrylonitrile-based carbon fiber precursor

(发明专利 ZL201610507033.4)

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**





• 作为结构材料,具有高比强度、高比模量、优异的剪切强度等力学性能 Used as structural materials, having excellent mechanical properties such as high specific strength, high specific modulus, and good shear strength



• 作为功能材料,具有耐高温、耐烧蚀等优异的物理化学特性 Used as functional materials, having such outstanding physical and chemical characteristics such as enduring high temperature, and ablation resistance



•表面光滑、断裂伸长率高、可加工性好、纤维利用率和复合材料性能优良 Smooth surface, high elongation at break, good processability, excellent fiber utilization and composite properties

产品规格 Product specification	拉伸强 (MPa) Tensile strength	拉伸模 (GPa) Tensile modulus	断裂伸长率 (%) Elongation at break	线密度 (g/km) Yam density	密度 (g/cm³) Density	单丝直径 (μm) Monofilament diameter	申报企业 Declaring enterprise
QM4035-6K	4619	377	1.24	225	1.78	5	威海拓展 Weihai Tuozhan Fiber Co., Ltd.
QM4035-12K	4781	377	1.28	450	1.78	5	威海拓展 Weihai Tuozhan Fiber Co., Ltd.
SYM40-12K	≥ 4700	≥ 380	1.2	430	1.78	5	中复神鹰 ZhongfuShenying Carbon Fiber Co., Ltd.
						- 40	



**预浸技术**:适用于加工环氧树脂预浸料产品。

Pre-impregnating technique: suitable to process such prepreg products as epoxy resin.

**织物技术**:适用于加工碳纤维机织物,也可与玻璃纤维、芳纶纤维、玄武岩纤维混合编织。 **Techniques for fabrics:** suitable to process carbon fiber woven fabrics, also able to mix with glass fibers, aramid fibers, and basalt fibers in plaits.

## 纤维应用 ●••• Fiber Application

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 cleaning supplies
		$\sqrt{}$	$\sqrt{}$				$\sqrt{}$	
军用纺织品 Military textiles	特种纸 Special papers	户外用品 outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks	
				1				

#### USA A

#### Q: 该高强高模碳纤维技术装备及产品指标在国际上处于什么水平?

A:该产品的开发采用了具有自主知识产权的全流程国产化技术,能够实现均匀稳定生产,打破了国外的封锁。SYM40-12K系列产品性能已超过国外同类产品的技术指标,尤其是拉伸强度指标高出 15%以上;QM4035(M40J级)系列产品采用干喷湿纺技术,力学性能大幅提升,生产效率显著提高、能耗降低,产品拉伸强度(4410MPa)提高60%,在兼顾高模量的同时,赋予纤维更高的力学性能。

## Q: What is the international level of this high strength and high modulus carbon fiber technical equipment and product index?

**A:** The development of this product adopts the full-process localization technology with independent intellectual property rights, which can realize uniform and stable production and break the blockade of foreign countries. The performance of SYM40-12K series products has exceeded the technical indicators of similar foreign products, especially the tensile strength index is 15% higher; QM4035 (M40J grade) series products adopt dry-jet wet spinning technology, which greatly improves the fiber's mechanical properties, significantly improves production efficiency and reduces the energy consumption. The tensile strength of the product (4410MPa) is increased by 60%. While taking into account the high modulus, the fiber is given higher mechanical properties.



#### 压力容器用 HF30F 碳纤维

### HF30F Carbon Fiber for Pressure Vessels

#### 制备技术 Processing Technology

采用湿法纺丝工艺,通过在丝束形状、纤维表面和上浆剂处理等方面进行特殊优化,制备成具有优异缠绕工艺和成型性的 HF30F 聚丙烯腈基碳纤维。

HF30F polyacrylonitrile-based carbon fiber is prepared by wet spinning process which was optimized in terms of tow shaping, surface treatment and sizing. The product have excellent pass ability during winding process and formability.



流程示意图 Flow Chart of Preparation

#### 

#### 主要规格 Main Specifications

HF30F-12K, HF30F-24K



纤维原貌图 Fiber in original appearance

#### 标准及认证 Standards and Certifications

《HF30F 碳纤维》HF30F carbon fiber (Q/HS HSCP3-Q-TX-003A-2019)

#### 纤维性能与制品特点

#### **Fiber Performance and Product Features**

• 在丝束形状、表面处理和上浆处理等方面进行了优化,缠绕过程毛丝少,特别适用于缠绕成型工艺

The shape, surface treatment and sizing of the tow are optimized with less wool during the winding process, especially suitable for the winding forming process

- 纤维和缠绕树脂匹配后,纤维强度转化率不低于 60% After the fiber and the winding resin are matched, the fiber strength conversion rate is no less than 60%
- 纤维强度不低于 4800mpa, 断裂伸长率不低于 2%,综合性能稳定 The fiber strength is noless than 4800mpa, the elongation at break is no less than 2%, and the comprehensive performance is stable

产品规格	拉伸强度 (MPa)	拉伸模量 (GPa)	断裂伸长率 (%)	体密度 (g/cm³)	含碳量 (%))
Product specification	Tensile strength	Tensile modulus	Elongation at break	Volume density	Carbon contentr
HF30F-12K	≥ 4800	≥ 240	≥ 2.0	$1.80 \pm 0.02$	

#### 应用技术

#### **Application Technology**

应用于气瓶缠绕时,首先选择合适的树脂体系,为了验证纤维强度转化率,需要进行 NOL 环强度的测试,从而进行评估树脂和纤维是否匹配。

When applied to gas cylinder winding, an appropriate resin system is first selected. In order to verify the fiber strength conversion rate, a NOL ring strength test needs to be performed to evaluate whether the resin and fiber are matching.

#### 纤维应用

#### **Fiber Application**

主要用于压力容器领域,包括:大型压缩天然气(CNG)储罐、CNG运输罐、汽车用CNG气瓶、汽车用高压氢气瓶、加氢站氢气储罐、呼吸用氧气罐等。

Mainly used in the field of pressure vessels, including: large compressed natural gas (CNG) storage tanks, CNG transportation tanks, automotive CNG gas cylinders, automotive high-pressure hydrogen cylinders, hydrogen storage tanks for hydrogenation stations, and oxygen tanks for breathing, etc.

#### Q:压力容器用 HF30F 碳纤维的研发意义?

A: 随着国家清洁能源汽车的发展和相关产业政策持续支持,碳纤维在以车载氢气瓶等为代表的压力容器的需求迅速攀升。基于该产品的技术和市场培育成熟度稳定提升,通过市场调研,2020年需求量在1500吨以上,并且将以20%左右的年增长率增长,市场价值巨大。

### Q: What hat is the significance of the research and development of HF30F carbon fiber for pressure vessels?

**A:** With the development of clean energy vehicles and the continuous support of relevant industrial policies in China, the demand of carbon fiber in pressure vessels represented by onboard hydrogen cylinders is rapidly increasing. The maturity of technology and market cultivation based on this product has been steadily improved. Through market research, the demand in 2020 will be more than 1500 tons, and will grow at the annual growth rate of about 20%.



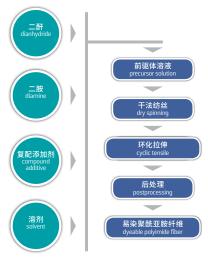
#### 易染聚酰亚胺纤维

### Dyeable Polyimide Fiber

#### 制备技术 Processing Technology

采用二胺和二酐为单体,选用合适的溶剂,并加入复配添加剂,通过低温缩聚,合成高分子量聚酰胺酸溶液,采用干法纺丝工艺技术制备前驱体纤维,通过环化—拉伸一体化生产工艺等后处理,得到易染聚酰亚胺纤维。

Using diamine and dihydride as monomers, choose appropriate solvents and add compound additives. The high molecular weight polyamide acid solution is synthesized by low-temperature polycondensation, and the precursor fibers are prepared by dry spinning technology. After the post-processing such as the integrated production process of cyclization-tensile, dyeable polyimide fiber is obtained.



流程示意图 Flow Chart of Preparation

#### 纤维及制品特点 ●・・・・・・・ **Characteristics of Fiber and Product**

#### 主要规格 **Main Specifications**

 $2.2dtex \times 51mm$ 

#### 标准及认证 **Standards and Certifications**

《聚酰亚胺纤维》 Polyimide fiber (GB/T 33617-2017) 通过 OEKO-TEX standard 100 认证 Passed OEKO-TEX standard 100 certification

#### 纤维性能与制品特点 **Fiber Performance and Product Features**





• 高强度高模量 High strength and high modulus



• 优良的耐高温、耐酸、耐辐射、阻燃 Excellent high temperature endurance, acid resistance, radiation resistance and flame retardant



• 易染色、染色牢度高 Easy to dye, high dyeing fastness

#### 应用技术

#### **Application Technology**

纺纱技术: 采用轻定量、小牵伸、慢车速的纺纱原则,严格把控车间温湿度,减少成纱毛羽, 改善纱线条干。

Spinning technology: adopting the spinning principle of light weight, small draft and slow speed, strictly controlling workshop temperature and humidity, reducing yarn hairiness and improving yarn evenness.

蒸纱工艺: 采用高温高压蒸纱, 提高纱线稳定性, 减小纱线扭矩。

Yarn steaming process: adopting high-temperature and high-pressure steaming yarn to improve yarn stability and reduce yarn torque.

后整理工艺:通过烧毛、刷毛、剪毛工艺的组合或重复加工,达到布面光洁,织纹清晰的 目的;通过热定型工艺,适当的延长定型时间和提高定型温度,使面料结构稳定。

Post-finishing process: Through the combination or repeated processing of singeing, brushing, and shearing processes, the cloth surface is smooth and the texture is clear; through the heat setting process, the setting time is appropriately extended and the setting temperature is increased to stabilize the fabric structure.





产品规格 Product specification	拉伸强度 (MPa) Tensile strength	断裂伸长 (%) Elongation at break	极限氧指数 (%) Limiting oxygen index	导热系数 (W/m•°C) Thermal conductivity	耐高温 High temperature endurance	后染染色牢度 (级) post-dyeing color fastness (grade)
2.2dtex51mm	≥ 4	10~30	30~35	0.03	220°C以下可长期使用 Long-term use below 220°C	4~5

#### 纤维应用

#### **Fiber Application**

	服装用纺织品 Clothing textiles											
	休闲服 Leisure wear	户外运动服 Outdoor sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater			
		$\sqrt{}$	√-	$\sqrt{}$								
	贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining			
	$\sqrt{}$	$\sqrt{}$							$\sqrt{}$			
	羽绒服 Down jacket	高端成衣 High-end ready- to-wear										
	家用纺织品 Home textiles											
	床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel						
Ľ	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$		$\sqrt{}$							
		产业用纺织品 Industrial textiles										
	汽车内饰 Automotive interior	电池隔膜 Battery separator	发电叶片 Power generation blade	体育用品 Sporting goods	医护用品 Medical supplies	过滤产品 Filtration products	卫生纺织品 Sanitary textiles	建筑增强 Building enhancement	清洁用品 Cleaning supplies			
	军用纺织品 Military textiles	特种纸 Special papers	户外用品 Outdoor products	消防用品 Fire Supplies	航空航天 Aerospace	压力容器罐 Pressure vessel tank	矿山传送带 Mine conveyor	面膜 Masks				
	√			$\sqrt{}$	$\sqrt{}$							

#### Q: 易染聚酰亚胺纤维的开发价值体现在哪?

A:解决了聚酰亚胺纤维的后期染色问题,提高了功能性纱线的美观性,拓宽了产品的应用市场,目前与下游终端品牌生产商际华集团、阳光集团等建立合作关系。

#### Q: What is the value for developing dyeable polyimide fiber?

**A:** It has solved the problem of post-dyeing problems of polyimide fiber, improved the aesthetics of functional yarn, and broadened the application scope of products. At present, it has established cooperative relations with downstream terminal brand manufacturers such as Jihua Group and Sunshine Group

## 中国纤维 流 行 题 势 报 集 CHINA FIBERS FASHION TRENDS REPORT 2020 / 2021

## 28 个入围产品 Recommend Products

#### 仿真纤维

**IMITATED FIBER** 

#### 仿麻聚酯纤维

Linen-like Polyester Fibe

#### 亲水易染复合聚酯纤维

Hydrophilic And Dyeable Composite Polyester Fiber

#### 高性能化学纤维

HIGH-PERFORMANCE CHEMICAL FIBER

#### 高强高模聚酰亚胺纤维

High–strength and High Modulus Polyimide Fiber

#### 苦砚丝

Polysulfonamide (PSA)

#### 功能纤维

FUNCTIONAL FIBER

#### 氧化锌聚酯纤维

Zinc Oxide Polyester Fibe

#### 低纤度低熔点聚酰胺 6 纤维

Low-fineness, Low-melting Polyamide 6 Fiber

#### 低纤度石墨烯改性聚酰胺 6 纤维

Low-fineness Graphene-modified Polyamide 6 Fiber

#### 天然矿物质添加改性聚酰胺 66 纤维

Modified Polyamide 66 Fiber with Natural Minerals

#### 轻柔纤维

SOFT FIBER

#### 细旦多孔扁平聚酯纤维

Fine Denier Flat Polyester Multifilamen

#### 超细聚乙烯纤维

Ultra-fine Polyethylene Fibe

#### 生物基化学纤维

BIO-BASED CHEMICAL FIBER

#### 无卤阻燃原液着色聚乳酸纤维

Halogen-free Flame Retardant Dope-dyed Polylactic Acid Fibers

# 弹性纤维

**ELASTIC FIBER** 

#### 超细多孔弹性聚酯纤维

Superfine Elastic Polyester Multifilament

#### PBT / PET 并列复合弹性纤维

PBT / PET Side-by-side Composite Elastic Fiber

#### 循环再利用化学纤维

RECYCLED CHEMICAL FIBERS

#### 地毯用循环再利用聚酯纤维

Recycled Polyester Fibers For Carpet

#### 仿皮草循环再利用聚酯长丝

lmitation Fur Recycled Polyester Filamen

#### 低温阳离子循环再利用聚酯纤维

Low-temperature Cationic Recycled Polyester Fibe

#### 医疗卫生用纤维

FIBERS FOR MEDICAL CARE AND PUBLIC HEALTH

#### 生物基 PHBV-PLA 复合纤维

PHBV-PLA Bio-based Composite Fiber

#### 银、锌双复合抑菌聚乳酸纤维

Bacteriostatic Polylactide Silver-zinc Composite Fiber

#### 纳米聚酯纤维

Polyester Nanofiber

#### 纳米聚丙烯腈纤维

Polyacrylonitrile Nanofiber

## 原液着色化学纤维

DOPE DYED CHEMICAL FIBER

#### 细旦原液着色聚酰胺 6 纤维

Fine Denier Dope Dyed Polyamide 6 Fiber

#### 细日多孔原液着色聚酰胺 6 纤维

Fine Denier Dope Dved Polyamide 6 Multifilament

#### 植物基原液着色再生纤维素纤维

Plant-Based Dope Dyed Regenerated Cellulose Fiber

#### 仿棉原液着色聚乳酸纤维

lmitation Cotton Dope Dyed Polylactic Acid Fiber

#### 原液着色聚丙烯腈纤维

Dope Dyed Polyacrylonitrile Fiber

### 阻燃纤维

FLAME RETARDANT

#### 阻燃原液着色聚酰胺 6 纤维

'Iame Retardant Dope Dyed Polyamide 6 Fiber

#### 绿化用原液着色无卤阻燃聚酰胺 66 单丝

Halogen-free Flame-retardant Dope Dyed Polyamide 66

#### 远红外抑菌硅氮系阻燃再生纤维素纤维

Far-Infrared Antibacterial Si-N Flame Retardant Regenerated Collulose Fiber

# 仿真纤维 |mitated Fiber

仿的最高境界在于真,通过纤维材料改性和纺织加工,使纤维的结构、 外观、光泽、手感和使用性能接近并超越天然纤维,实现肌肤零负担、 高清爽的舒适享受。

The highest state of imitation lies in the reality. Through fiber material modification and textile processing, the structure, appearance, luster, feel and use performance of the fiber are close to and beyond that of natural fiber, and zero-burden for skin and highly relaxed comfort is achieved.



特点: 手感柔软厚实、不易打滑、弹性强、易加固、吸湿性较好

**规格:** 222~666dtex/324~384F

**应用技术:** 使用 DTY 时,首先将丝饼落筒至 0.5~0.8KG/ 个,放入 135℃左右的

高温蒸箱,加入 0.2MPa 蒸汽,使其收缩并定型 3h

应用领域: 高档装饰、专用墙纸、亚麻服装

品牌: 桐昆

企业:桐乡市恒基差别化纤维有限公司

## 亲水易染复合聚酯纤维

特点: 亲水性和吸湿排汗功能强,回潮率稳定在1.20%、制品可低温常压染色

**规格:** 72~225dtex/30~74F

应用技术: 织造环节应控制张力、减小波动,避免原料拉伤、断头

应用领域: 高档运动服、球衣、衬衣、T 恤、针织内衣

品牌: 斯绵

企业:徐州斯尔克纤维科技股份有限公司



### **Linen-like PolyesterFiber**

**Feature:** Soft and thick feel, not easy to slip, strong elasticity, easy reinforcement, good hygroscopicity

**Specification:** 222–666dtex/324–384F

**Applied technology:** When using DTY, first roll the packages down to 0.5 – 0.8KG / piece, then put it into a high-temperature steam box at around  $135\,^{\circ}$ C, and add 0.2MPa steam to make it shrink and set for 3h

**Application field:** High-end decoration, special wallpaper, linen clothing

**Brand: Tongkun** 

Enterprise: Tongxiang Hengji Differential Fiber Co., Ltd.

### **Hydrophilic and Dyeable Composite Polyester Fiber**

**Feature:** The function of hydrophilicity and moisture wicking are strong, moisture regain is stable at 1.20%, and the product can be dyed at low temperature and normal pressure.

Specification: 72-225dtex/30-74F

**Applied technology:** The tension should be controlled, and fluctuations should be reduced in weaving links to avoid raw material strains and breaks.

Application field: High-end sportswear, jerseys, shirts, T-shirts, knitted underwear

Brand: Simian

Enterprise: Xuzhou Silk Fiber Technology Co., Ltd.

# High-performance Chemical Fiber 高性能化学纤维

高性能化学纤维的开发是一个不断挑战自我的过程,随着科技发展 水平的提高,对纤维材料性能的要求也随之提高。高强度、高模量、 耐高温、物化性能优异稳定的高性能纤维是各国发展的重点,为国 防事业、环境保护和尖端科学等提供有力保障。

The development of high-performance chemical fibers is a process of constantly challenging ourselves. With the development of science and technology, the requirements for the performance of fiber materials have also increased. High-performance fiber with high strength, high modulus, high temperature endurance, excellent and stable physical and chemical properties is the focus of development in various countries, providing a strong guarantee for national defense, environmental protection and cutting-edge science.

#### 高强高模聚酰亚胺纤维

特点: 高强度、高模量、耐高温、阻燃

**规格:** 550dtex/168F

应用技术: 经编与纬编均适用,制品耐酸不耐碱

应用领域: 防护服装、轻质电缆护套、耐高温特种编织电缆、

卫星天线张力索、空间飞行器囊体增强材料

品牌:轶纶

企业: 长春高琦聚酰亚胺材料有限公司

### 芳砜纶

**特点:** 耐高温、本质阻燃、绝缘性好、高温尺寸稳定性好、柔

软舒适、易染色

**规格:** 2.22dtex × 51mm

应用技术: 为保证浅色产品的耐光色牢度需要优选染料

**应用领域:** 消防、军工防护、工业防护、高端民用头套、高温

烟气过滤、家用纺织品等

品牌:特安纶

企业: 上海特安纶纤维有限公司



# **High-strength and High Modulus Polyimide Fiber**

Feature: high strength, high modulus, high temperature endurance, flame retardant

Specification: 550dtex/168F

**Applied technology:** Warp knitting and weft knitting are applicable, and the products are resistant to acid but not to alkali.

**Application field:** protective clothing, lightweight cable sheath, special braided cable with high temperature endurance, satellite antenna tension cable, space vehicle capsule reinforcement material

Brand: Yi Lun

Enterprise: Changchun Gaoqi Polyimide Materials Co., Ltd.

### Polysulfonamide(PSA)

**Feature:** high temperature resistance, inherent flame retardant, good insulation, good dimensional stability at high temperature, soft and comfortable, easy to dye

**Specification:** 2.22dtex×51mm

**Applied technology:** In order to ensure the lightfastness and fastness of light-colored products, optimized dyes are required

**Application field:** fire protection, military protection, industrial protection, high-end civilian hoods, high temperature smoke filtration, home textiles

Brand: Te Anlun

Enterprise: Shanghai Te Anlun Fiber Co., Ltd.

# Functional Fiber

# 功能纤维

功能纤维的发展代表着现代纤维科学的进步,卫生功能(抑菌、防螨)、防护功能(防辐射、抗静电、抗紫外线)以及舒适保健功能(远红外发射、吸湿速干)等功能的开发,完美演绎了纤维的多元性与延展性。

The development of functional fibers represents the advancement of modern fiber science. The development of sanitary function (antibacterial, anti-mite), protective function (anti-radiation, anti-static, anti-ultraviolet) and comfortable health function (far-infrared emission, moisture absorption and quick-drying), etc. perfectly demonstrates the diversity and ductility of the fiber.

#### 氧化锌聚酯纤维

特点:添加活性氧化锌抑菌母粒、持久抑菌

**规格:** 短纤 1.2~4dtex/38~51mm; 长丝 67.5~90dtex/36~144F

应用技术:建议混纺比例不低于40%;在染整过程中,不能

经过强酸环境

应用领域:内衣、服装、袜子、无纺布等

品牌・GINTER HILL

企业: 博富科技股份有限公司

# 低纤度低熔点聚酰胺 6 纤维

特点: 透气性良好、染色性能好、色牢度高、柔顺舒适、抗皱

**规格:** 22.2~55.5dtex/3~10F **应用技术:** 湿软化点: 90℃~95℃

应用领域:高档蕾丝、内衣、领片、袖口、羽绒服、高档西服

内衬、织带、手套、毛衣等

品牌:恒申

企业: 长乐恒申合纤科技有限公司



#### Zinc Oxide Polyester Fiber

**Feature:** Add active zinc oxide antibacterial masterbatch, durable antibacterial **Specification:** staple 1.2-4dtex/38-51mm; filaments 67.5-90dtex/36-144F

**Applied technology:** It is recommended that the blending ratio is not less than 40%; the strong acid environment is not permitted in the process of dyeing and finishing.

**Application field:** underwear, clothing, socks, non-woven fabrics, etc.

Brand: GINTER HILL

Enterprise: Bilic-Fortune Technology Co,. Ltd.

### Low-fineness, Low-melting Polyamide 6 Fiber

**Feature:** Good breathability, good dyeing performance, high color fastness, soft and comfortable, anti-wrinkle

**Specification:** 22.2–55.5dtex/3–10F

**Applied technology:** Wet softening point : 90°C-95°C

**Application field:** high-end lace, underwear, collar, cuffs, down jacket, high-end suit lining, webbing, gloves, sweaters, etc.

Brand: Hengshen

Enterprise: Changle Hengshen Synthetic Fiber Technology Co., Ltd.



#### 低纤度石墨烯改性聚酰胺 6 纤维

特点: 加工性能优良、抗紫外、抑菌、远红外发射

**规格:** 33.3dtex/24F (FDY)

**应用技术:** 染色、织造、后整理等工序均与常规锦纶一致 **应用领域:** 轻薄羽绒服、袜子、内衣裤、手套、家纺等

品牌:烯纳斯

企业: 常州恒利宝纳米新材料科技有限公司

### 天然矿物质添加改性聚酰胺 66 纤维

**特点:** 远红外、抑菌、负离子 **规格:** 31~78dtex/23~68F

**应用技术:** 织造前丝饼需平衡 24 小时; 织物染前水洗温度为 70 °C ~80 °C,PH 值为 8,时间为 20 ~40 分钟; 推荐使用酸性染料染色; 后整理定型温度为 180 °C ~190 °C,

时间为 20~40 秒

**应用领域:** 束身衣、运动休闲服装、保暖服装、汽车内饰、 军用纺织品等

品牌:银珠

企业: 辽宁银珠化纺集团有限公司



#### Low-fineness Graphene-modified Polyamide 6 Fiber

Feature: excellent processing performance, anti-ultraviolet, antibacterial, far-infrared emission

**Specification:** 33.3dtex/24F (FDY)

**Applied technology:** Dyeing, weaving, post-finishing and other processes are consistent with conventional nylon.

**Application field:** Lightweight down jacket, socks, underwear, gloves, home textiles, etc.

Brand: Xinasi

Enterprise: Changzhou Highbery New Nano Materials Technology Co., Ltd.

#### **Modified Polyamide 66 Fiber with Natural Minerals**

Feature: Far infrared, antibacterial, negative ion

Specification: 31-78dtex/23-68F

**Applied technology:** Cakes need to be equilibrated for 24 hours before weaving; the washing temperature before dyeing the fabric is  $70^{\circ}\text{C}-80^{\circ}\text{C}$ , the PH value is 8 and the time is 20 – 40 minutes; acid dyeing is recommended; the setting temperature after finishing is  $180^{\circ}\text{C}-190^{\circ}\text{C}$  for 20 – 40 seconds

**Application field:** corsets, sports and leisure clothing, thermal clothing, automotive interiors, military textiles, etc.

Brand: Yinzhu

Enterprise: Liaoning Yinzhu Chemtex Group Co., Ltd.

# Soft Fiber 轻柔纤维

"比发丝更细、比羽毛更柔",轻柔纤维将轻薄、柔韧的特质充分呈现。制品既节省了原材料的使用,又克服了重力对人体的约束,赋予服装柔软丝滑、轻盈细腻的质感,使消费者充分感受自由,释放真我。

"Thinner than hair and softer than feather", the soft fiber fully reflects the characteristics of thinness and flexibility. The product not only saves the use of raw materials, but also overcomes the constraint of gravity on the human body. It gives clothing a soft, silky, light and delicate texture, so that consumers can feel free and release their true self.

#### 细旦多孔扁平聚酯纤维

**特点:** 轻柔、吸湿性好

规格: 182dtex/288F 有光扁平轻网

应用技术: 织造前必须在高温箱中蒸透后再加工;

蒸煮温度保持在137℃左右,8h左右,以免聚酯纤维变僵硬

应用领域: 高端服装、毛衫、针织、室内装饰饰品等

品牌: 金鸡

企业: 桐乡市中洲化纤有限责任公司

#### 超细聚乙烯纤维

**特点:** 手感柔软滑爽、亲肤、自凉感且凉感系数高**规格:** 短纤 0.5dtex × 3mm; 长丝 192dtex/384F

应用技术:与锦纶等共纺,织物的定型温度在120℃以内;用于动力电池隔膜的制备,要求纤维的细度在0.5dtex以内应用领域:运动服 如果 高度 电池隔膜(短红)等

应用领域:运动服、被子、凉席、电池隔膜(短纤)等

品牌: 酷纺、酷艺

企业: 凯泰特种纤维科技有限公司



#### **Fine Denier Flat Polyester Multifilament**

Feature: soft and hygroscopic

**Specification:** 182dtex/288F with bright flat light interlaced filament

**Applied technology:** Before weaving, it must be steamed in a high-temperature box before processing; the cooking temperature is maintained at about 137°C for about 8 hours to prevent the polyester fiber from becoming stiff

**Application field:** high-end clothing, sweaters, knitting, interior decorations, etc.

Brand: GOLDENCOCK

Enterprise: Tongxiang Zhongzhou Chemical Fiber Co., Ltd.

### **Ultra-fine Polyethylene Fiber**

Feature: Soft and smooth, skin-friendly, self-cooling and high coolness coefficient

Specification: staple 0.5dtex×3mm; filaments 192dtex/384F

**Applied technology:** co-spinning with nylon and others, setting the fabric at a temperature of 120°C or less; Preparation for battery separator, the required fineness of the fiber within 0.5dtex

Application field: sportswear, quilts, summer sleeping mat, a battery separator (staple), etc.

Brand: Kufang, Kuyi

Enterprise: Kaitai Special Fiber Technology Co., Ltd.

# Bio-based Chemical Fiber

# 生物基化学纤维

生物基纤维原料来源于大自然,生活废弃物、农林、海洋副产物,是人类实现可持续发展的必由之路。生物基纤维与人体亲和,天然 抑菌、生物降解、加工低碳,促进生产者和消费者践行绿色低碳的 环境责任。

The raw materials for bio-based fibers come from the nature, residential waste, agriculture and forestry, and marine by-products, necessary for human beings to achieve sustainable development. Bio-based fibers are friendly towards human bodies, naturally inhibiting bacteria, biologically degradable, emitting less carbon when being processed, and helping manufacturers and consumers fulfill the responsibility for a low-carbon environment.

## 无卤阻燃原液着色聚乳酸纤维

特点: 抑菌防螨、阻燃、亲肤、易洗快干、生物降解

**规格:** 165dtex/144F (DTY)

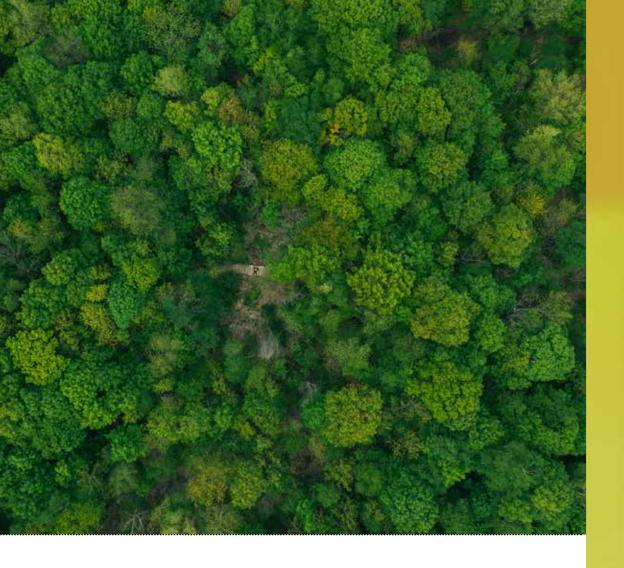
应用技术: 适用分散染料,不耐强酸强碱; 定型温度需

低于聚乳酸玻璃化温度

应用领域:家纺、窗帘、童装、僧服、航空阻燃材料等

品牌:御丝

企业:河南省龙都生物科技有限公司



# **Halogen-free Flame Retardant Dope-dyed Polylactic Acid Fibers**

**Feature:** Bacteriostatic and anti-mite, flame retardant, skin-friendly, easy to wash and dry, biodegradable

**Specification:** 165dtex/144F (DTY)

**Applied technology:** suitable for disperse dyes, not resistant to strong acids and alkalis; the setting temperature should be lower than the glass transition temperature of polylactic acid

**Application field:** home textiles, curtains, children's wear, monk clothing, aviation flame retardant materials, etc.

Brand: Yusi

Enterprise: Henan Longdu Biotechnology Co., Ltd.

# 弹性纤维

# Elastic Fiber

健身运动的人逐渐增多,运动休闲风变成了一种生活态度,对 运动服舒适性的要求也越来越高。聚酯纤维、聚酯复合纤维经 特殊工艺加工,让运动服柔软舒适兼具运动感,升级运动体验。

With the increasing people of fitness exercise, the style of sports and leisure has become a living attitude, and the requirements for the comfort of sportswear have become higher and higher. Polyester fiber and polyester composite fiber are processed through a special process, to make sportswear soft and comfortable with a sense of movement and upgrade the sports experience.

#### 超细多孔弹性聚酯纤维

特点: 低纤度、超细、手感柔软、弹性较好

**规格:** 20~75dtex/72~288F

**应用技术:** 和传统加工工艺类似,注意防止起毛

应用领域:羽绒服、床上用品、家居用品

品牌:泉迪

企业: 宁波泉迪化纤有限公司

### PBT/PET 并列复合弹性纤维

特点: 低温柔软性好、弹性及抗皱回弹性好,具有常温易染

双色效果及较好的吸湿排汗性能 **规格:** 111~167dtex/96~108F

应用技术: 布料染色温度在100℃~120℃, 定型温度在

150°C

应用领域: 服饰

品牌:天翼

企业: 洪泽联合化纤有限公司



#### **Superfine Elastic Polyester Multifilament**

Feature: low-fineness, superfine, soft to touch, good elasticity

Specification: 20-75dtex/72-288F

**Applied technology:** Similar to traditional processing technology, pay attention to prevent fluff

Application field: Down jacket, bedding, household supplies

Brand: Quan Di

Enterprise: Ningbo Quan Di Chemical Fiber Co., Ltd.

### **PBT / PET Side-by-side Composite Elastic Fiber**

**Feature:** Good softness at low temperature, good elasticity and anti-wrinkle resilience, easy to dye two-color effect at room temperature, and better moisture absorption

Specification: 111-167dtex/96-108F

**Applied technology:** cloth dyeing temperature is  $100^{\circ}\text{C}$ – $120^{\circ}\text{C}$ , setting temperature is  $150^{\circ}\text{C}$ 

Application field: apparel

Brand: Tianyi

Enterprise: Hongze Lianhe Chemical Fiber Co., Ltd.

# Recycling Chemical Fiber 循环再利用化学纤维

"绿色发展,生生不息"。循环再利用纤维对废弃资源综合利用,实现循环、低碳与高附加值的统一。在媲美原生品质的前提下,开发出更多功能定制化的产品,拓展应用领域。在不经意中,循环再利用纤维已经走进了平常百姓的生活。

"Green development is endless." Recycled fiber comprehensively utilizes waste resources to achieve the unity of recycling, low carbon and high added value. On the premise of being comparable to native quality, more customized products have been developed and the application field have been expanded. Inadvertently, recycled fiber has permeated the lives of ordinary people.

### 地毯用循环再利用聚酯纤维

**特点:** 弹性卷曲伸长率高、耐磨性好,织物色泽鲜艳、毯面丰满、不易污染、 不易倒伏

规格: 1440dtex/96F

**应用技术:** 印花宜用分散染料,在高温 130℃~150℃下固色; 加捻定型温度

宜高,饱和蒸汽温度在138℃~142℃,热风定型温度为150℃~160℃

应用领域: 机织地毯织造

品牌: Longtu

企业: 龙福环能科技股份有限公司



# **Recycled Polyester Fibers for Carpet**

**Feature:** High elastic elongation, good abrasion resistance, bright fabric color, full carpet surface, not easy to stain, not easy to fall

**Specification:** 1440dtex/96F

**Applied technology:** printing is preferable to disperse dyes, and fixation is performed at a high temperature of  $130^{\circ}\text{C}-150^{\circ}\text{C}$ ; twist–setting temperature should be high, the saturated steam temperature is  $138^{\circ}\text{C}-142^{\circ}\text{C}$ , and hot air setting temperature is  $150^{\circ}\text{C}-160^{\circ}\text{C}$ .

Application field: woven carpet weaving

Brand: Longfu

Enterprise: Long Fu Environmental Energy Technology Co., Ltd.



### 仿皮草循环再利用聚酯长丝

特点: 功能复合、全消光中空卷曲、制品绒感强

**规格:** 222dtex/30F

**应用技术:** 比原生纤维强度略低; 卷绕产品密度较低, 表面摩擦小、易塌边、所以卷绕张力要稍大一些,后道在拿取丝饼时要轻拿轻放, 退绕时张力适当减小

应用领域: 皮草

品牌: 如盛

企业: 苏州春盛环保纤维有限公司

### 低温阳离子循环再利用聚酯纤维

**特点:** 循环再生、抗起毛起球、舒适柔软、保温、吸湿

排汗

**规格:** 1.33~1.67dtex × 28~102mm

应用技术: 常压 100℃阳离子染色,上色率高,不需要

还原清洗

应用领域: 机织、针织面料

品牌: 午和纤维

企业: 江苏垶恒复合材料有限公司



#### **Imitation Fur Recycled Polyester Filament**

**Feature:** functional composite, full extinction hollow curl, strong velvet feel

Specification: 222dtex/30F

**Applied technology:** Slightly lower strength than virgin fiber; lower density of wound products, less surface friction, easy to sag, so the winding tension should be slightly larger, when handling the packages in the following process, it should be taken lightly and the tension should be appropriately reduced when unwinding.

Application field: fur

**Brand: Rusheng** 

Enterprise: Suzhou Chunsheng Environmental Fiber Co., Ltd.

### Low-temperature Cationic Recycled Polyester Fiber

Feature: Recycling, anti-pilling, comfortable and soft, thermal insulation, moisture wicking

**Specification:** 1.33 – 1.67 dtex × 28 – 102mm

**Applied technology:** Cationic dyeing at 100°C under atmospheric pressure, high coloring rate, no reduction cleaning required

Application field: Woven and knitted fabric

**Brand: Wuhe Fiber** 

Enterprise: Jiangsu Yongheng Composite Materials Co., Ltd.

# Fibers for Medical Care and Public H₽A|↑ 医疗卫生用纤维

医疗卫生纤维制品是人们抵抗外界细菌、病毒的一道屏障。 随着人们生活水平的提高,以及对 健康、环境保护意识的不断增强,对医疗卫生制品提出了更高的要求。可生物降解纤维、纳米 纤维在防护人体健康的同时,也做到了对环境的保护,形成良好的循环。

Fiber products for medical care and public health are considered to be a barrier for humans to resist bacteria and viruses. With the improvement of people's living standards and increasing awareness of health and environmental protection, higher requirements have been placed on products for medical care and public health. In this regard, biodegradable fibers and nanofibers have been protecting both the environment and human health, forming a virtuous circle.

#### 生物基 PHBV-PLA 复合纤维

**特点:** 极高的抗菌性和驱螨性、全生物质可降解,面料柔软凉爽、耐水性好

**规格:** 短纤 1.50dtex × 38mm 长丝 75~150dtex/48F

**应用技术:** 分散染料,染浴 PH 值≈ 5.0,浴比为 30:1,染色温度在 100°C左右;

热定型温度在 95℃以下

应用领域: 防护服、口罩、抑菌袜、服装

品牌: 禾素

企业: 宁波禾素纤维有限公司

### 银、锌双复合抑菌聚乳酸纤维

特点: 抑菌性能良好、亲肤、生物可降解

**规格:** 1.33dtex × 38mm、1.56 dtex × 38mm、3.33 dtex × 51mm 十字形、

6.67 dtex × 51mm 中空截面等

**应用技术:** 纤维熔点约 173°C,制作水刺无纺布时,烘箱温度建议不超过 130°C。

建议聚乳酸纤维购买后及时使用

**应用领域:** 一次性口罩、防护服、医用敷料、抑菌干湿巾、床上用品、妇婴用品

品牌: 德福伦

企业: 上海德福伦纤维有限公司



#### **PHBV-PLA Bio-based Composite Fiber**

**Feature:** Excellent antibacterial and acaricidal property, biomass and biodegradability, soft and cool fabric, and great water resistance

Specification: Staple fiber1.50dtex×38mm Filament75-150dtex/48F

**Applied technology:** Disperse dye, the dye bath with the PH value of about 5.0 and the bath ratio of 30:1, the dyeing temperature at around 100°C, and the heat setting temperature below 95°C

Application field: Protective clothing, masks, bacteriostatic socks, clothing

**Brand: Bioserica** 

Enterprise: Ningbo Bioserica Fiber Co., Ltd.

### **Bacteriostatic Polylactide Silver-zinc Composite Fiber**

Feature: Excellent bacteriostatic property, skin friendliness and biodegradability

**Specification:** 1.33dtex×38mm,1.56 dtex×38mm, 3.33 dtex×51mm Cruciform; 6.67 dtex×51mm hollow sections, etc.

**Applied technology:** The melting point of the fiber is about 173°C, and it is suggested that the temperature of the oven during production of spunlace non-woven fabric should be below 130°C. It is further recommended that the polylactide fiber should be used immediately after purchase.

**Application field:** Disposable masks, protective clothing, medical dressing, dry and wet bacteriostatic wipes, bedding articles, and maternity & infant products

Brand: Brand: Different

Enterprise: Shanghai Different Chemical Fiber Co., Ltd.



#### 纳米聚酯纤维

特点: 吸附能力强、阻隔性能强、透气透湿、舒适性好

规格: 平均直径为 200nm, 纳纤膜孔隙率≥ 90%, 膜材料细菌过滤效

率 97.8 %,膜材料颗粒过滤效率 62.1 %

**应用技术:** 不需要印染加工,根据尺寸需求直接裁剪缝制使用,或者根

据需求复合其他材料

应用领域防护口罩(外科口罩、KN90型、KN95型、KN100)、防护服、

隔离服、过滤材料

品牌:愉悦

企业:愉悦家纺有限公司

### 纳米聚丙烯腈纤维

特点: 高效拦截细菌病毒、物理拦截、延长使用时间

**规格:** 纤维直径 100-300nm, 拦截效率≥ 95% (0.3 μ m 以上的颗粒)

应用技术:参考传统过滤材料使用

应用领域:一次性防护口罩、KN95 防护口罩、空气过滤器

品牌: 富瑞邦

企业: 嘉兴富瑞邦新材料科技有限公司





#### **Polyester Nanofiber**

**Feature:** Excellent adsorption capacity and barrier property, as well as good air and moisture permeability and comfort performance

**Specification:** Mean diameter of 200 nm, porosity of nanofiber membranes  $\ge$  90%, bacterial filtration efficiency of membrane material up to 97.8%, and the filtration efficiency of membrane material to particles up to 62.1%.

**Applied technology:** No dyeing processing is required, and it can be directly cut and sewn for use according to size requirements, or it can be compounded with other materials according to the needs.

**Application field:** Protective masks (surgical masks, KN90, KN95, KN100), protective clothing, isolation clothing, and filter materials

**Brand: Yuyue** 

Enterprise: Yuyue Home Textile Co., Ltd.

## **Polyacrylonitrile Nanofiber**

**Feature:** High efficiency of intercepting bacteria and viruses, physical interception, and prolonged service life

**Specification:** Fiber diameter of 100–300 nm, and interception efficiency  $\ge$  95% (particle size above 0.3  $\mu$ m)

**Applied technology:** Refer to traditional filter materials for use

**Application field:** Disposable protective masks, KN95 protective masks, and air filters

**Brand: Brand: Furuibang** 

Enterprise: Jiaxing Furuibang New Materials Technology Co., Ltd.

# Dope Dyed 原液着色化学纤维 Chemical Fiber

原液着色纤维在纺丝成型过程中实现纤维染色,减少了印染过程,节约能源,减少排放,同时融合细旦化、功能化的技术,赋予多种功能。织物颜色鲜艳、色泽均匀、经久耐用、不易褪色。在当下符合绿色环保就是追逐时尚潮流的风尚。

Dope dyed fiber achieves the dyeing in the process of spinning molding, which reduces the dyeing process, saves energy and reduces emissions, while incorporating the techniques of denierization and functionalization to give a variety of functions. The fabric is bright and uniform in color, durable, and not easy to fade. It is to follow the fashion trend if it is in line with environmental protection at the moment.

#### 细旦原液着色聚酰胺 6 纤维

特点: 原液着色、耐磨性好、强度高、低纤度

规格: 22.0dtex/24F (FDY)

**应用技术:** 因使用高浓缩色母粒,织造定型温度不超过 180℃,以免纤维黑度衰弱; 织造过程中喷水织机水质不可偏酸性 (要求 PH 值中性),

以免纤维受损

应用领域: 丝袜、运动服饰、内衣、羽绒服面料、服装内衬等

品牌:凯邦

企业: 福建凯邦锦纶科技有限公司

### 细旦多孔原液着色聚酰胺 6 纤维

特点: 原液着色、色泽均匀、色牢度高、柔软性高

**规格:** 177dtex/136F

应用技术:参考常规聚酰胺6纤维产品

应用领域:高端跑步服、运动服、瑜伽服、羽绒服面料等

品牌: 免染彩锦 ATY 纱

企业: 浙江嘉华特种尼龙有限公司



#### Fine Denier Dope Dyed Polyamide 6 Fiber

Feature: dope dyed, good abrasion resistance, high strength, low fineness

**Specification:** 22.0dtex / 24F (FDY)

**Applied technology:** Due to the use of highly concentrated masterbatches, the weaving setting temperature does not exceed 180°C to prevent the fiber blackness from weakening; the water quality of the water jet loom during the weaving process must not be acidic (requiring a neutral pH value) to prevent fiber damage.

**Application field:** stockings, sportswear, underwear, down jacket fabrics, clothing linings, etc.

**Brand: Kaibang** 

Enterprise: Fujian Kaibang Nylon Technology Co., Ltd.

### **Fine Denier Dope Dyed Polyamide 6 Multifilament**

Feature: dope dyed, uniform color, high color fastness, and high flexibility

**Specification:** 177dtex/136F

Applied technology: refer to conventional polyamide 6 fiber products

**Application field:** high-end running clothes, sportswear, yoga clothes, down jacket fabrics, etc.

Brand: Dye-free colorful brocade ATY yarn Enterprise: Zhejiang Jiahua Special Nylon Co., Ltd.



#### 植物基原液着色再生纤维素纤维

特点: 原液着色、生物基、抑菌、除臭、抗紫外线

**规格:** 1.22dtex × 38mm

**应用技术:** 纺纱、织造过程中尽量避免使用油剂;可采用免浆制造;水洗及后整理工艺中,禁止使用酸、碱及高温工艺;定型宜采用低温定型,温度为 $150^{\circ}$ C $^{\circ}$ 180 $^{\circ}$ C;非织造时植物染色纤维纺织品需采用干燥、密封、避光保存

方式;尽量避免长期折贴保存和光照

应用领域:内衣、袜子、被褥、枕套、床单等

品牌: 圣桑

企业: 宜宾惠美纤维新材料股份有限公司

#### 仿棉原液着色聚乳酸纤维

**特点:** 原液着色、可生物降解、抑菌防螨、亲肤透气、保暖

**规格:** 86dtex/72F

**应用技术:** 低温条件下,用分散染料染色、印花及涂层等; 整个生产过程中

注意低温即 125℃以下,不使用强碱 **应用领域:** 服装面料、窗帘、内衣

品牌: 昌新逸丝

企业: 嘉兴昌新差别化纤维科技有限公司

## 原液着色聚丙烯腈纤维

特点: 原液着色、色牢度高(比普通染色纤维高 0.5 级以上)、耐日晒牢度好

**规格:** 1.08~2.7dtex/38~106mm

应用技术:参考聚丙烯腈纤维常规产品

**应用领域:** 毛毯、人造毛皮、毛绒玩具、手套、袜子等(毛型纤维) 针织内衣、运动衫、薄绒衫、围巾、帽子、装饰品等(腈纶棉型纤维)

品牌: 白山

企业: 河北吉藁化纤有限责任公司



#### **Plant-based Dope Dyed Regenerated Cellulose Fiber**

Feature: dope dyed, bio-based, antibacterial, deodorant, anti-ultraviolet

Specification: 1.22dtex×38mm

**Applied technology:** Try to avoid the use of oil during spinning and weaving. It can be made without pulp. It is forbidden to use acid, alkali and high temperature in the washing and finishing process. The low temperature should be used for the setting at 150°C-180°C; When non-woven, plant-dyed fiber textiles should be stored in a dry, sealed method and protected from light; try to avoid long-term storage and sunlight.

Application field: underwear, socks, bedding, pillowcases, sheets, etc.

**Brand: Sheng Sang** 

Enterprise: Yibin Huimei Fiber New Material Co., Ltd.

#### **Imitation Cotton Dope Dyed Polylactic Acid Fiber**

**Feature:** dope dyed, biodegradable, antibacterial and anti-mite, skin-friendly, breathable, warm

Specification: 86dtex/72F

**Applied technology:** Under low temperature conditions, disperse dyes are used for dyeing, printing and coating, etc. During the entire production process, pay attention to low temperature, which is below 125°C, and do not use strong alkali.

Application field: clothing fabrics, curtains, underwear

**Brand: Changxin Yisi** 

Enterprise: Jiaxing Changxin Differential Fiber Technology Co., Ltd.

### **Dope Dyed Polyacrylonitrile Fiber**

**Feature:** dope dyed, high color fastness (more than grade 0.5 higher than ordinary dyed fiber), good light fastness

 $\textbf{Specification:}\ 1.08-2.7 dtex/38-106 mm$ 

Applied technology: refer to conventional polyacrylonitrile fiber products

**Application field:** blankets, man-made fur, plush toys, gloves, socks (wool fibers) knitted underwear, sweatshirt, velvet, scarf, hat, accessories, etc. (acrylic cotton fiber)

Brand: Baishan

Enterprise: Hebei Jifeng Chemical Fiber Co., Ltd.

# Elame Retardant Fiber

纺织品是关系到国计民生的重要基础材料,除了日常生活领域,在农业、医疗、军事、航空航天、 交通运输等领域都有广泛应用,但纤维制品也成为引发火灾的主要隐患之一。阻燃纤维阻燃隔热, 还能复合抑烟、抗菌、远红外等功能,丰富纤维品种,为消费者提供安全保障。

Textile is an important basic material related to national economy and people's livelihood. In addition to daily life, it is widely used in agriculture, medical treatment, military, aerospace, transportation and other fields, but fiber products have also become one of the main hidden dangers of fire. Flame retardant fiber is flame retardant and heat insulation, and can also combine smoke suppression, antibacterial, far-infrared and other functions to enrich the variety of fibers and provide consumers with security.

#### 阻燃原液着色聚酰胺 6 纤维

特点: 原液着色、烟毒性小(符合航空内饰标准)、烟密度低、氧指数高

**规格:** 156~465dtex/24~48F (FDY)、156-255dtex/24-48F (DTY)、1250 dtex/66F(BCF) **应用技术:** 无卤阻燃纤维在应用中热稳定性和机械性能良好,对色彩需求高的用户,需要

再染色, 以获得新鲜颜色

**应用领域:** 军民融合单兵装备(织带、便携具)、消防、粘胶扣、沙发套、公共工程防护网等

品牌: CESALON

企业: 上海安凸阻燃纤维有限公司

### 绿化用原液着色无卤阻燃聚酰胺 66 单丝

特点: 原液着色、无卤、环保、耐候、永久阻燃

**规格:** 12000dtex (PA66 单丝)

**应用技术**: 阻燃人工草纱使用方法: 先针织,然后再上胶,背胶注意锁力,避免造成草纱脱落

应用领域: 机场绿化、人造草坪、粘扣带

品牌:多力隆

企业: 昆山力泰纤维有限公司

### 远红外抑菌硅氮系阻燃再生纤维素纤维

特点: 无卤阻燃、隔热、远红外、抑菌

**规格:** 1.67dtex/38mm

**应用技术:** 不建议纯纺,可加入一定量的阻燃腈纶进行混纺;清梳棉工序中,需多次开松, 并放低车速; 染整过程中,推荐使用生物酶退浆; 不建议强力漂白,如进行轻漂,使用氢

氧化钠溶液的浓度要小于 0.2%; 染深色, 建议不进行前处理, 直接进行染色

应用领域: 防护服、家纺制品、交通内饰等

品牌: SOLFR

企业: 北京赛欧兰阻燃纤维有限公司



#### Flame Retardant Dope Dyed Polyamide 6 Fiber

**Feature:** dope dyed, low smoke toxicity (compliance aeronautical inner decoration standards), low smoke density, high limited oxygen index

**Specification:** 156-465dtex/24-48F (FDY), 156-255dtex/24-48F (DTY), 1250dtex/66F (BCF)

**Applied technology:** Halogen–free flame–retardant fibers have good thermal stability and mechanical properties in applications. For users with high color demands, itneed to be re–dyed to obtain fresh colors.

**Application field:** Military–civilian individual equipment (webbing, portable equipment), fire protection, adhesive buckle, sofa cover, public engineering protection net, etc.

**Brand: CESALON** 

Enterprise: Shanghai Antu Flame Retardant Fiber Co., Ltd

# Halogen-free Flame-retardant Dope Dyed Polyamide 66 Monofilament for Greening

**Feature:** dope dyed, halogen-free, environmental protection, weather resistance, permanent flame retardant

**Specification:** 12000dtex (PA66 monofilament)

**Applied technology:** method of using artificial grass yarn: first knitting, and then the plastic, note ack-adhesive locking force, to avoid causing grass yarn off.

**Application field:** airport greening, artificial turf, hook and loop

**Brand: Duolilong** 

Enterprise: Kunshan Litai Fiber Co., Ltd.

# Far-Infrared Antibacterial Si-N Flame Retardant Regenerated Cellulose Fiber

Feature: halogen-free flame retardant, thermal insulation, far infrared, antibacterial

**Specification:** 1.67dtex/38mm

**Applied technology:** Pure spinning is not recommended, a quantity of flame-retardant acrylic can be added for blend spinning; In the process of carding, it is necessary to loosen for many times and lower the speed. In dyeing and finishing process, it is recommended to use biological enzyme desizing; Strong bleaching is not recommended. For light bleaching, the concentration of sodium hydroxide solution should be less than 0.2%. For dark color, it is recommended to dye directly without pretreatment.

**Application field:** protective clothing, home textiles, transportation interiors, etc.

**Brand: SOLFR** 

Enterprise: Beijing SOL Flame-Retardant Fiber Co., Ltd.

# 2020/2021 China Yarns Fashion Trends 中国纱线流行趋势

# 绿色生态类

色纺纱系列

Colored Yarn Series

纯棉纱系列 Cotton Yarn Series

**差别化纱线系列** Differentiated Yarn Series

差别化纱线系列

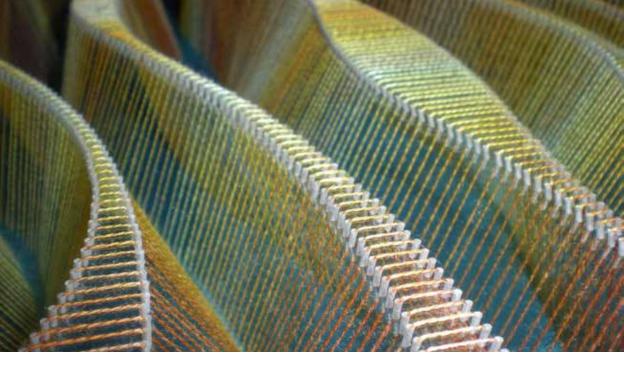
# 性能优化类 PERFORMANCE OPTIMIZATION

色纺纱系列 Colored Yarn Series

纯棉纱系列 Cotton Yarn Series

差别化纱线系列

Differentiated Yarn Series



2020年是全面建成小康社会和"十三五"规划的收官之年,我国纺织行业积极调结构、转方式、促升级,根据"科技、时尚、绿色"的定位要求,实现纺织工业的高质量发展。

2019年,中国棉纺织行业协会(简称"中棉行协")启动了中国纱线流行趋势研究与发布, 秉承"创新""绿色""低碳""环保""时尚"原则,挖掘引领中国纱线发展趋势的产品,推广新产品技术与应用、推进纱线品牌建设。

在开展流行趋势评选的活动中,共收到 20 多家企业报送的近 50 余个纱线产品,由中棉行协组织行业、院校和企业专家,从工艺技术、时尚文化、市场竞争、品牌文化等多角度进行综合评价,评选出设计合理、性能优异、市场适用性强的产品入围,并以"美好生活"为主题,将入围的产品进行系列化阐述,最终确定 2020/2021 中国纱线流行趋势的入围名单。

2020/2021 中国纱线流行趋势产品拥有绿色生态、功能赋予、性能优化、三大方向, 并分为色纺纱类、纯棉类、差别化类三大系列产品。

**绿色生态** 坚持绿色发展理念,在原料、染色、后整理等非纺纱环节,遵循绿色环保的生产原则,倡导绿色、生态、循环利用的生活理念。代表产品特点有:有机棉植物染、环保涂料染色、良好棉花、循环可再生、环保可降解、无添加抗菌抑菌等。

**功能赋予** 通过创新采用多组分纤维、新型纺纱工艺,赋予纱线更多功能,如抗菌抑菌、 预防螨虫、防静电、抗紫外线、吸湿快干、高弹挺括等功能。

**性能优化** 在常规纤维、传统纺纱工艺基础上创新纤维混纺、工艺调整、设备改造, 优化纱线性能,如抗起毛起球、挺括易打理、色牢度高、透气凉爽、细腻飘逸等特点。

希望通过中国纱线流行趋势的发布,最终能够倡导积极向上的生产与生活理念,打造纺织产品发展的风向标,形成行业新的增长点。

The year 2020 marks the ending battle for achieving the China's goal of building a moderately prosperous society in all respects and the "Thirteenth Five-Year Plan". China's textile industry is now taking the initiative to adjust the structure, shift the pattern and promote upgrading in accordance with the positioning requirements for "science and technology, fashion and environmental protection", so that high-quality development of the textile industry is reached

China Cotton Textile Association (CCTA for short) launched the research and release for China Yarn Trends in 2019. Guided by the principles of "innovation, environmental protection, low-carbon development and fashion", the association aims to explore the products leading the development trends of Chinese yarn, popularize the technology and application of new products and promote the building of yarn brands.

In the product selection process, more than 50 yarn products were submitted by over 20 enterprises. CCTA organizes industries, universities and colleges and enterprise experts to carry out comprehensive evaluation on these products from the perspectives of process technology, fashion culture, market competition, brand culture and so forth. The products that have rational design, excellent performance and strong market applicability were selected for the next round of competition and subjected to serialization elaboration under the theme of "Beautiful Life". Finally, a shortlist for products with the 2020/2021 China Yarn Trends was determined.

The products with 2020/2021 China Yarn Trends are excellent mainly in three directions of performance optimization, function endowing and

green ecology, and are divided into three series of products of colored spun yarn, pure cotton and differentiation series.

#### **Green ecology**

Adhere to the concept of green development, abide by the production principle of environmental protection and advocate the life ideas of environmental protection, ecology and recycling in the non-spinning links like raw material selection, dyeing, and after-finishing. Representative products feature organic cotton plant dyeing, environment-friendly coating dyeing, Better Cotton, recycling and regeneration, environmental protection and biodegradable, antibacterial without additives. etc.

#### **Function endowing**

The yarn is endowed with more functions like bacteria resistance and bacteriostasis, mite prevention, static electricity resistance, ultraviolet resistance, hygroscopicity, quick drying, high elasticity and stiffness by innovative adoption of the multicomponent fiber and new spinning technology.

### **Performance optimization**

Innovation is made in fiber blending, process adjustment, and equipment modification based on the conventional fiber and traditional spinning process to optimize the yarn performance like pilling resistance, stiffness, easy care, high color fastness, air permeability, cool, fineness, smoothness and elegance.

It is hoped that through the release of China Yarn Trends, the positive production and life philosophy can be advocated, a wind vane for the development of textile products can be set up, and a new growth point of the industry can take shape finally.

# 有机棉植物染①色纺纱

### Organic Cotton Plant Dyeing <sup>1</sup> Colored Spun Yarn

产品规格: 100% 有机棉 JC 白 /JC 色 80/20; 50 支

关键词:绿色环保,防虫抑菌,色彩自然

推荐理由:采用紧密赛络纺纱<sup>②</sup>方式,通过创新色纺工艺管理,提高植物染色色牢度,解决化学染色有悖绿色环保的初衷,植物染染料自中草药中提取,具有防虫、杀菌、护肤及防过敏等功效,充分体现了生态绿色环保的理念。

适用范围: 婴幼儿服装,内衣,居家服等

代表企业:无锡一棉纺织集团有限公司;品牌——"TALAK"

产学研: 东华大学、江南大学、哈尔滨工程大学等院校进行合作; 下设纤维

新材料应用及新产品研发,纺织科技情报及新技术、纺织智能制造、

纺织绿色生产、中埃纺织技术合作五个研究室

认证、标准及专利: ISO9001 质量管理认证、环保认证等



 $\textbf{Product specification:}\ 100\%\ organic\ cotton\ JC\ white\ /\ JC\ color$ 

80/20; 50 counts

**Keywords:** Green environmental protection, insect prevention and antibacterial, natural color

**Reasons for recommendation:** Adopting compact siro–spinning <sup>®</sup> mode, improving the color fastness of plants dyeing through innovative color spinning process management, solving the chemical dyeing contrary to the original intention of green environmental protection. The plant dye was extracted from Chinese herbal medicine, which has the functions of insect prevention, sterilization, skin care and anti–allergy, fully embodying the concept of ecological green environmental protection.

**Scope of application:** Baby clothing, underwear, home clothes, etc.

**Representative enterprise:** Wuxi No. 1 Cotton Mill Textile Group Co., Ltd., Brand – "TALAK"

**Industry-university-research:** It has cooperated with Donghua University, Jiangnan University, Harbin Engineering University and other institutions; and set up five research labs such as fiber new material application and new product research and development, textile science and technology information and new technology, textile intelligent manufacturing, textile green production and Sino-Egypt textile technology cooperation.

**Certification, standards and patents:** passed the ISO9001 Quality Management Certification and environmental protection certification

#### 指标 Indicator comparison

品种 Variety	有机棉 + 植物染 + 色纺: JC 白 /JC 色 80/20 50sK 紧密赛络纱 Organic cotton + plant dyeing + color spinning: JC white / JC color 80/20 50 sK compact sirospun	普通棉 + 白纺 + 化学染: JC50sK 紧密赛络纱 Ordinary cotton + chemical dyeing + white spinning JC50sK compact sirospun
条干 CV% Evenness CV%	13.05	13.16
棉结 +200%/km Nep+200%/km	49	53.3
毛羽 Hairiness	2.88	3.21
强力 /cN Strength/cN	229.7	223.3
水洗牢度 Washing fastness	4+	4-5



植物染属于天然染料的一种,是从茶叶、中药、水果、草本植物、木本植物和蔬菜中提取色素进行染色,染色过程中不使用任何化学助剂,是纯天然环保的工艺技术,较好地解决了织物染色率低、染色时间长和色牢度差的问题。

原液着色法是在纺丝熔体或者溶液中加入适当的着色母粒或 者着色剂,经充分混合,纺制成有色纤维。再生纤维素纤维、 聚丙烯腈纤维(腈纶)的着色法均属此种方法。

**纤维染色**是以散纤维或条子为对象的染色工艺,也称条染。 这样的染色方式可以使织物的颜色均匀。

**纱线染色**是以纱线为对象的染色工艺。主要有:经轴染色、绞纱染色、筒子纱染色等。

2

紧密赛络纺:是在改进的环锭细纱机上,进行纺纱的一种新型纺纱技术。结合了紧密纺和赛络纺的优点,在纺纱过程中,由两根粗纱同时被牵伸后,再合并成一根赛络纱。紧密赛络纱具有单纱强力高、条干均匀、结构紧密、耐磨性好、毛羽少、纱线光洁等优点。既有股纱的风格特点也具有单纱的属性,紧密赛络纺各项指标比普通环锭纱在不同程度上都有明显的提高。在后道工序还可以提高织造效率,减少纱线上蜡、上浆量,减少退浆过程中的环境污染,并可取消烧毛工序等。紧密赛络纺纱所织成的织物纹路清晰、光泽好、耐磨、不易起球。

喷气涡流纺: 涡流纺的纺纱原理是,通过喷射气流形成的涡流场,带动纤维扭转包缠形成具有皮芯结构的纱线。纱线由近似呈平行无捻状纤维构成的纱芯和外围呈螺旋状包缠的纤维组成。其纱线的特点是: 适宜机织和针织物,织物手感硬、挺、蓬松、丰满、厚实、透气性好、耐磨、染色性好。转杯纺: 转杯纺的原理是,喂入的纤维条被分梳辊开松成单纤维后随气流输送到高速回转的转杯内壁,在凝聚槽内形成纱尾,同时被加捻成纱引出,直接绕成筒子。其纱线特点是织成的织物手感丰满厚实、保暖性好、耐磨、吸浆和吸湿性好,吸色率高。

# TIPS 1

**Plant dyeing** is a kind of natural dyestuff. It is a pure natural and environmental dyeing technology, which extracts pigment from tea, Chinese medicine, fruit, herbaceous plant, woody plants and vegetables without using chemical additives during the dyeing process. It solves the problems of low dyeing rate, long dyeing duration and poor color fastness.

**The stock solution coloring method** is to add the appropriate coloring masterbatch or coloring agent in the spinning melt or solution, and then mix and spin to make colored fiber. The coloring method of regenerated cellulose fiber and acrylic fiber (acrylic) all belongs to this method.

**Fiber dyeing** is a kind of dyeing process with loose fiber or sliver as the object, which is also called sliver dyeing. This method of dyeing provides the fabric with a balance color.

**Yarn dyeing** is a dyeing process which takes yarn as the object. It mainly includes beam dyeing, skein dyeing and cheese dyeing and so on.

2

Compact siro-spinning: is a new spinning technique on an improved ring spinning frame. Combining the advantages of compact spinning and siro-spinning, two roving are drawn at the same time, and then combined into a siro yarn in the spinning process. The single yarn of compact siro-yarn has the advantages of high strength, even evenness, compact structure, good wear resistance, less hairiness and smooth yarn. It has both the style characteristics of the plied yarn and the properties of single yarn; the indexes of compact siro-spinning are obviously higher than that of the ordinary ring spinning in different degree. In the later process, it can also improve the weaving efficiency, reduce the amount of yarn waxing and sizing, reduce the environmental pollution in the desizing process, and eliminate the singeing process. The fabric made of compact siro-pinning has clear lines, good luster, wear resistance and is not easy to pilling.

**Air-jet vortex spinning:** the principle of vortex spinning is that the vortex field formed by jet airflow drives the fiber to twist and wrap to form the yarn with leather core structure. The yarn consists of a yarn core of approximately parallel untwisted fibers and a spiral wrapped fiber. Its yarn features are: Suitable for woven and knitted fabrics, with hard hand feeling, stiff, fluffy, full, thick, good permeability, wear resistance and good dyeing fibric.

**Rotor spinning:** Its principle is that the feed fiber strip is loosened into a single fiber by the combing roller and then transported to the inner wall of the rotor with high speed rotation by air flow. The yarn tail is formed inside the coagulation and is drawn out by twisting into yarn and wound directly into a bobbin. Fabric woven from the yarn has full and thick hand feeling, good warmth, wear resistance, good sizing and hygroscopicity and high color absorption.



## 绿色抑菌保暖纱

## Green Bacteriostatic Warm Yarn

产品规格: 40% 再生纤维素纤维 (优可丝®安泰贝®抑菌再生纤维素纤维③),30%

棉 (BCI 精梳棉<sup>④</sup>),30% 聚丙烯腈纤维 (腈纶);纱支40

关键词: 原液着色、节能环保、保暖抑菌

推荐理由:采用再生纤维素纤维、原液着色(见知识补给站<sup>①</sup>)细旦抗起球聚丙烯腈纤维(腈纶)、BCI棉纤维通过节能环保的色纺纱工艺进行混纺,开发出具有抑菌保暖功能的色纺纱;此外,多种颜色的混合搭配呈现出朦胧之美,赛络紧密纺纱技术的应用进一步改善了成纱质量。

适用范围: 秋冬保暖内衣

代表企业: 山东联润新材料科技有限公司; 品牌——"联润"

产学研: 纺织新材料纱线产品开发基地、国家纺织新材料纱线流行趋势研究中心,建有山东省工业设计中心、山东省新材料纱线工程技术中心、山东省企业技术中心等与天津工业大学、东华大学、青岛大学等国内纺织类高校和科研院所深入交流合作认证、标准和专利: GB/T 19001-2016 质量管理体系认证、环境管理体系认证、职业健康管理体系认证

#### 指标 Indicator comparison

TET小 IIIUICa	tor companison	
	纱线品种 Yarn varieties	赛络紧密纺 L6532 R/JC/A 40/30/30 14.8 tex Siro-spinning yam L6532 R/JC/A 40/30/3014.8 tex
	检验项目 Inspection item	检验结果 Inspection result
	线密度偏差率 % Yarn density variation rate	+0.6
	捻系数 Twist factor	368
捻度 Degree of twist	捻度 (捻 twist/10cm) Degree of twist (twist / 10cm)	95.7
	捻不匀 % Uneven twist %	2.7
	单纱断裂强力 /cN Breaking strength of single yarn/cN	204.5
强力	单纱断裂强度 cN/tex Breaking tenacity of single yarn cN/tex	13.8
Strength	强力 CV% Strength CV%	4.1
	断裂伸长率 % Elongation at break%	7.7
	CVm%	11.84
Uster 条干	-50%/km	1
Uster Evenness	+50%/km	15
	+200%/km	25
毛羽	毛羽指数 Hairiness index H	3.47
Hairiness	3mm 毛羽数 (根 /10m) 3mm Hairiness number (one/10m)	17



**Product specification:** 40% regenerated cellulose fiber (EcoCosy $^{(8)}$ , Antaibei $^{(8)}$ antibacterial regenerated cellulose fibers  $^{(9)}$ , 30% cotton (BCI combed cotton  $^{(3)}$ , 30% acrylic fiber (acrylic); yarn count 40

**Keywords:** Stock solution coloring, energy conservation and environment protection, warm and bacteriostatic

**Reasons for recommendation:** Using regenerated cellulose fiber, stock solution coloring (refer to supplementing knowledge  $^{\odot}$ ), fine denier anti–pilling acrylic fiber (acrylic), BCI cotton fiber, it developed a color spinning yarn with bacteriostatic and warm–keeping function by blending energy–saving and environment–friendly color spinning process; In addition, the multi–color mix–and–match presents the hazy beauty, and the application of siro compact spinning technology has further improved the quality of resultant yarn.

Scope of application: Thermal underwear for autumn and winter

Representative enterprise: Long Run Textile Co., Ltd.; Brand – "Long Run"

**Industry-university-research:** National Textile New Material Yarn Products Development Base, National Textile New Material Yarn Fashion Trend Research Center, Shandong Industrial Design Center, Shandong New Material Yarn Engineering Technology Center, Shandong Enterprise Technology Center etc.; carrying out in-depth exchanges and cooperation with domestic textile universities and scientific research institutes such as TianGong University, Donghua University and Qingdao University.

**Certification, standards and patents:** GB/T 19001–2016 Quality Management System Certification, Environmental Management System Certification, Occupational Health Management System Certification





## 知识补给站 3

**优可丝·安泰贝:** 优可丝<sup>®</sup> 安泰贝<sup>®</sup> 再生纤维素纤维是一种活性抑菌纤维素纤维,是通过共混纺丝技术将活性抑菌物质均匀分散在纤维表面及内部,对细菌、真菌及病毒等微生物具有抑制作用,获得持久的抑菌效果。目前该纤维由赛得利生产。

4

**BCI 棉花:**良好棉花由瑞士良好棉花发展协会(Better Cotton Initiative,简称 BCI)进行认证并发放证书,生产原则是培养农民就如何合理使用化肥和农药等形成正确的操作规范,降低对作物和土壤的破坏,有效利用水资源,增强劳动者劳动保护意识,维护正当的劳动者权益等。

**有机棉**:有机棉(Organic Cotton)的种植、生产标准完全不同于良好棉花。有机棉需要对土地进行认证,由常规生产过渡到有机生产需要有转换期,一般为3年。不允许使用转基因种子,不允许使用任何化肥和农药,对水资源的使用无要求。

TIPS 3

**EcoCosy·Antaibei:** EcoCosy® Antaibei® regenerated cellulose fiber is a kind of active bacteriostatic cellulose fiber, which distributes the active bacteriostatic substance on the surface and inside of the fiber by blending spinning technology, it has a long-lasting bacteriostatic effect on bacteria, fungi, virus and other microorganisms. The fiber is currently produced by Sateri.

4

**BCI Cotton:** Better Cotton is certified by the Better Cotton Initiative (abbreviated as BCI) with a certificate. The principle of production is to train farmers to form correct operating rules on the proper use of fertilizers, pesticides, etc., so as to reduce the damage to crops and soil, effectively use of water resources, enhance workers' awareness of labor protection, and safeguard the legitimate rights and interests of workers.

**Organic cotton:** Organic Cotton has different planting and production standards from Better Cotton. Organic cotton requires land certification and a transition period from conventional to organic production, typically 3 years. The use of genetically modified seeds is not permitted, no chemical fertilizers or pesticides are permitted, and water use is not required.

## 环保涂料染色纯棉纱

## Pure Cotton Yarn with Environment-friendly Coating Dyeing

产品规格: 100% 棉; 18.2\*2 tex

关键词:零排放、色彩时尚

推荐理由: 一款以创新技术实现产品生态化和时尚化的彩色牛仔纱线。纱线运用多花色新型纱线连续涂料染色技术生产,生产从源头削减 98% 的用水量,最终产生的微量废水全部蒸馏回用,实现了纱线染色全流程的零排放。

适用范围: 创意服装、家纺面料

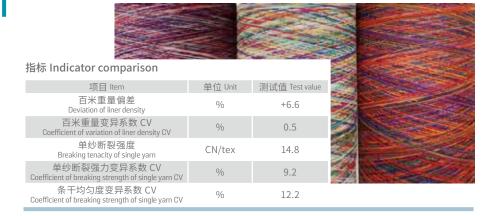
代表企业: 张家港三得利染整科技有限公司; 品牌——"绿尚"

产学研:与武汉纺织大学开展科研合作,江苏省企业研究生工作站,苏州市近零排放染色

工程技术研发中心

**认证、标准及专利:** 通过了张家港市科技局组织的专家"零排放"鉴定,获得《含棉纱线的

染色方法》等11项国家授权发明专利



**Product specification:** 100% cotton; 18.2\*2 tex **Keywords:** Zero emission, fashionable color

**Reasons for recommendation:** It is a kind of color denim yarn that achieves product ecology and fashion based on innovative technology. The yarn is produced with continuous coating dyeing technology of new multi-color yarn, which reduces the water consumption by 98% from the source, and distills and reuses the final micro-wastewater, thus realizing the zero emission of the whole yarn dyeing process.

Scope of application: Creative clothing, home textile fabrics

**Representing enterprises:** Zhang Jia Gang Sundeli Dyeing Technology Co. Ltd.; Brand – "Greenvogue" **Industry-university-research:** Scientific research cooperation with Wuhan Textile University, graduate workstation of enterprise in Jiangsu Province, Suzhou Near Zero Emission Dyeing Engineering Technology R & D Center

**Certification, standards and patents:** passed the "zero emission" appraisal organized by the experts of Zhangjiagang Bureau of Science and Technology, and obtained 11 state-authorized invention patents, such as Dyeing Method of Cotton Yarn



产品规格:紧密赛络纺棉纤维/再生棉93/7;11支

关键词:循环再利用

推荐理由:通过一系列环保措施,从回收的衣服中分离出棉纤维,以一定的比例与正常棉纤

维混合纺纱,并通过了 RCS 认证⑤,技术手段非常规。

应用领域: 牛仔用纱、家纺产品用纱

代表企业: 山东岱银纺织集团股份有限公司; 品牌——"岱银"

产学研:与东华大学、江南大学、天津大学建立科研合作关系,是省部级以上科技和工程中

心,复合纺纱省级实验室

**认证、标准及专利:** ISO9001 质量管理认证、ISO14001 环境保护认证、OHSAS28001 职业

健康安全管理体系认证,以及 GRS 认证、RCS 认证

 $\textbf{Product specification:} \ compact \ siro-spinning \ cotton \ fiber \ / \ regenerated \ cotton \ 93/7; 11 \ counts$ 

**Key words:** Recycling

**Reasons for recommendation:** Cotton fibers were separated from the recovered clothes and blended with normal cotton fibers in a certain proportion through a series of environmental protection measures. It also passed the RCS certification <sup>®</sup> with unconventional technical means.

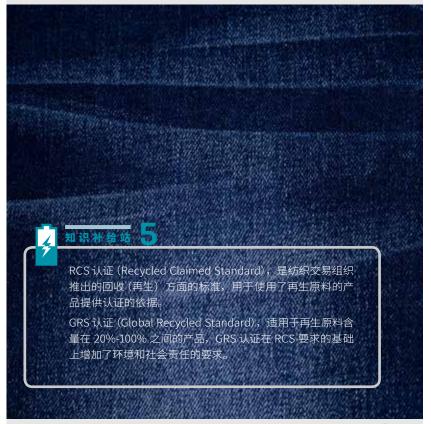
Application Fields: Denim yarn, yarn for home textile products

Representing enterprises: Shandong Daiyin Textile Group Share Co., Ltd; Brands – "Daiyin"

**Industry-university-research:** It has established scientific research cooperative relationship with Donghua University, Jiangnan University and Tianjin University, and has a technology and engineering center at provincial level and above, as well as provincial laboratories of composite spinning

**Certification, standards and patents:** ISO9001 Quality Management Certification, ISO14001 Environmental Protection Certification, OHSAS28001 Occupational Health and Safety Management System Certification, as well as GRS Certification and RCS Certification

#### 指标 Indicator comparison 测试值 Test value 项目 Item 单位 Unit 百米重量偏差 % +1.0 Deviation of liner density 百米重量变异系数 CV % 0.6 Coefficient of variation of liner density CV 单纱断裂强度 CN/tex 16.1 Breaking tenacity of single yarn 单纱断裂强力变异系数 CV % 7.1 Coefficient of breaking strength of single yarn CV 实际捻系数 % 409 Actual twist multiplier



# TIPS 5

The Recycled Claimed Standard (RCS) certification refers to the recycled (renewable) standard developed by the textile trade organization, which is used to provide certification for products using recycled materials.

Global Recycled Standard (GRS) certification is applicable to products with recycled material content between 20% and 100%, GRS certification adds environmental and social responsibility requirements on the basis of RCS requirements.

## 抗紫外线混纺纱

## Uv Resistant Blended Yarn

**产品规格:** 再生纤维素纤维 (再生纤维素纤维⑥) / 珍珠纤维⑦ / 抑菌聚酯纤维 / 精 梳棉 30/25/25/20

关键词: 养颜护肤、抗紫外线、吸湿透气

推荐理由:珍珠纤维具有养颜护肤、嫩白皮肤,抗紫外线的功效,吸湿透气、服用舒适,经久耐用。制成的面料既有抑菌、养颜护肤的功效,又有吸湿透气、穿

着舒适、抗紫外线以及发射远红外线等功能。

适用范围: 家纺、服装、内衣

代表企业: 夏津仁和纺织科技有限公司; 品牌——"仁杰"、"舒馨"

产学研:与东华大学、青岛大学、德州学院建立了良好的技术交流合作关系,是国

家高新技术企业,已有多个省、市级研发技术平台

**认证、标准和专利:** ISO9001 质量认证、ISO14001 环境认证 **实用新型专利:** 一种紧密纺小罗拉组合(ZL201821387314.1)

#### 指标 Indicator comparison

项目 Item	指标 Index
强力 Strength cN	≥ 175CN
强力 Strength CV%	≤ 8.5%
条干 Evenness	≤ 12.8
-50%细节 Snick	≤ 5
+50 粗节 Nub	≤ 18

**Product specification:** Regenerated cellulose fiber (regenerated cellulose fiber ®) / pearl fiber ® / bacteriostatic polyester fiber / combed cotton

**Key words:** Beauty skin care, UV resistant, moisture absorption and breathable

**Reasons for recommendation:** Pearl fiber has the effect of nourishing skin, whitening skin, resisting UV, absorbing moisture, and is very comfortable and durable. The fabric made from pearl fibers can resist bacteria, nourish skin, absorb moisture, and is breathable, comfortable, UV resistant as well as emitting far infrared rays.

Scope of application: Home textile, clothing, underwear

**Representing enterprises:** Xiajin Renhe Textile Technology Co., Ltd.; Brands – "Renjie", "Shuxin" **Industry-university-research:** It has established a good technical exchange and cooperation with Donghua University, Qingdao University, Dezhou University, and is the national high-tech enterprise with a number of provincial and municipal R & D technology platform.

**Certification, standards and patents:** ISO9001 Quality Certification, ISO14001 Environment Certification

Utility model: a kind of compact spinning small roller assembly(ZL201821387314.1)





# TIPS 6

Regenerated cellulose fiber: It is a kind of cellulose fiber which is obtained by extracting and remodeling fiber molecules from natural lignocellulose with "wood" as the raw material. Pure  $\alpha\text{-cellulose}$  (pulp) was extracted from cellulose raw materials and treated with caustic soda and carbon disulfide to obtain orange-yellow sodium cellulose xanthate, which was dissolved in dilute sodium hydroxide solution and then became a viscous spinning solution, which is called regenerated cellulose fiber. After filtering, curing and defoaming, the regenerated cellulose fiber is spun by wet spinning. The coagulating bath consists of sulfuric acid, sodium sulfate and zinc sulfate. Sodium cellulose xanthate in regenerated cellulose fibers was decomposed by the action of sulfuric acid in solidification bath, thus cellulose was regenerated and precipitated, which becomes regenerated cellulose fibers after washing, desulfurization, bleaching and drying.

Lyocell fiber: The generic term for cellulose fibers produced by organic solvent spinning by the International Bureau for Rayon and Synthetic Fibers Standard. It mainly uses NMMO as the solvent and natural fiber plants as the raw material, it has many excellent properties of natural fiber and synthetic fiber. Lyocell belongs to green fiber, and its raw material is cellulose, which is inexhaustible in natural. No chemical reaction in the production process, and the solvent used is non-toxic. Regenerated cellulose fiber reappeared the rapid growth due to its health and environmental protection consciousness and advocating of nature.

**Modal fiber:** Modal fiber is a cellulose fiber made from wood pulp from the European shrubbery (beech) with special spinning process. Modal fiber has both the strength and toughness of synthetic fiber, whose strength is higher than pure cotton and polyester cotton with good shape and stable dimension. The fabric made of it has a natural crease resistance and wash and wear resistance, making it more convenient and natural to wear.

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**Pearl fiber:** adopts blending method to add nanometer pearl powder to fiber, making the inner and outer surface of the fiber evenly distributed with nanometer pearl particles. Each fiber is like a string of pearl necklace, which is very bright and smooth. Modern scientific analysis shows that pearls are rich in calcium and magnesium, phosphorus, zinc and other micronutrient, as well as 18 amino acids, seven of which are essential amino acid, a variety of proteins and short peptides, growth–promoting factors and active factors which cannot be studied by existing science and technology.



## 抑菌纤维混纺纱

Antibacterial Fiber Blended Yarn

产品规格: 莫代尔<sup>⑥</sup>70/ 禾素<sup>⑧</sup>30;32 支

关键词: 防虫抑菌、柔软亲肤

推荐理由: 纱线有真丝的风格与手感,同时兼具优良的抑菌性、生物相容性、生物安全性、可降解性等。禾素纤维不需要添加任何化学抑菌助剂或金属离子即可达到抑菌的目的。将禾素纤维与其他纤维混纺所制备的面料,抑菌效果 99% 以上,达到抑菌 AAA 级标准,且多次洗涤抑菌效果不衰减。产品通过了抑菌性、可降解性、生物基、食品级安全检测。

适用范围: 功能性针织、梭织、产业用纺织品

代表企业:南京禾素时代抗菌材料科技有限公司;品牌——"禾素时代"

**Product specification:** Modal ® 70 / BIOSERICA ® 30; 32 counts **Keywords:** Insect-proof and bacteria-proof, soft and skin-friendly

**Reasons for recommendation:** The yarn has the style and hand feeling of silk, as well as excellent antibacterial activity, biocompatibility, biosafety and degradability. It is not necessary to add any chemical bacteriostatic agent or metal ion to the BIOSERICA fiber to achieve the purpose of bacteriostatic. The bacteriostatic effect of the fabric made from the mixture of the BIOSERICA fiber and other fibers was over 99%, which reached the level of AAA, and its bacteriostatic effect does not decline after washing for many times. The product has passed many detections such as antibacterial activity, degradability, biology base and food–grade safety.

**Scope of application:** Functional knitting, woven, industrial textiles

**Representing enterprises:** Nanjing Bioserica Era Antibacterial Materials Technology Co.,; Brand – "BIOSERICA ® FRA"



#### 指标 Indicator comparison

品种 Variety	单纱断裂强度 (cN/tex) Breaking tenacity of single yarn	条干 CV% Evenness CV%	抑菌性 Antibacterial activity
JC32S	16.5	13.5	无 No
JC70/ 禾素 30-32 支 JC70/ BIOSERICA 30-32 counts	16.0	14.0	大肠杆菌:88%;金黄色葡萄球菌: 99%;白色念珠菌:87% Escherichia coli:88%; Staphylococcus aureus; 99%; Candida albicans; 87%
MD40S	16.0	12.0	无 No
MD70/ 禾素 30-40 支 MD70/ BIOSERICA 30-40 counts	15.9	12.4	大肠杆菌:86%;金黄色葡萄球菌: 99%;白色念珠菌:95% Escherichia coli:86%; Staphylococcus aureus; 99%; Candida albicans; 95%



# 知识补给站 8

禾素纤维:聚羟基丁酸羟基戊酸酯 (PHBV) 由于具有优异生物相容性和可降解性,获得国内外学者的青睐,但由于其原料加工窗口窄,易于热降解且熔体粘度大,故可纺性较差。近几年,通过共混改性技术,经过熔融纺丝制备PHBV/PLA 共混纤维,产品具有真丝光泽和手感,可应用于高档服装、卫生护理、医卫材料领域。

# TIPS 8

**Hesu fiber:** Because of its excellent biocompatibility and degradability, polyhydroxybutyrate valerate (PHBV) has been favored by scholars at home and abroad, but its spinnability is poor due to its narrow raw material processing window, easy thermal degradation and high melt viscosity. In recent years, PHBV / PLA blend fiber was prepared by melt spinning through blending modification technology. The product has silk luster and hand feeling, and can be used in high-grade clothing, health care and medical materials.

## 环保可降解纱

## Environment-friendly Degradable Yarn

产品规格: 丁纶® 100%, 32 支

关键词:环保可降解

推荐理由: 丁纶纱线所纺的面料具有弹性和舒适性, 既能提供其 他化纤原料无法匹敌的天然手感和悬垂性,又克服了传统氨纶 面料弹性回复性差、不耐日晒和多次穿着后弹性松弛变形等缺点, 给面料的开发提供更多的可能。

适用范围:环保服饰、购物袋、家纺用品等

代表企业: 临邑恒丰纺织科技有限公司; 品牌——"恒锦"、"恒惠" 产学研:与德州学院、天津工业大学、青岛大学、奥地利兰精公司、 天竹纤维产业联盟,午和差别化纤维有限公司等单位建立长期稳 定的合作关系,是山东省企业技术中心,市级特种纱线工程技术 研究中心

**Product specification:** Polybuthylenesuccinate @ 100%, 32 counts Key words: Environment-friendly degradable

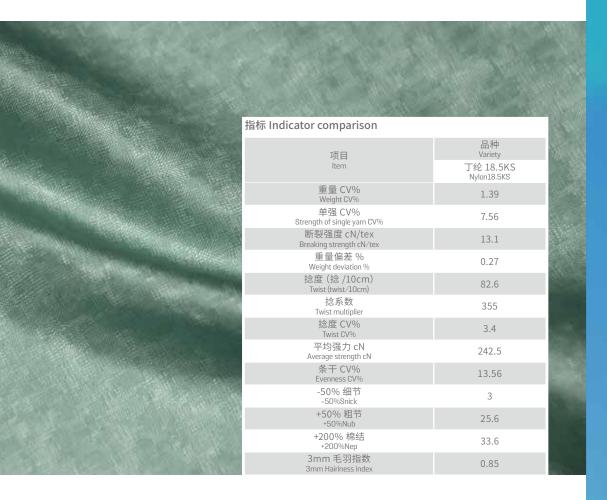
**Reasons for recommendation:** The fabric made from the nylon yarn is elastic and comfortable and can provide the natural hand feeling and draping that other chemical fiber raw materials cannot match. It also overcomes the shortcomings of the traditional spandex fabric, such as poor elastic resilience, not resistant to sun and elastic relaxation deformation after wearing for many times and provides more possibilities for the fabric development.

**Scope of application:** Green clothing, shopping bags, home textile supplies, etc.

Representing enterprises: Linyi Hengfeng Textile Technology Co., Ltd.; Brand – "Hengjin", "Henghui"

Industry-university-research: It has established long-term and stable cooperative relations with Dezhou University, Tianjin Polytechnic University, Qingdao University, Austrian Lenzing Group, Tianzhu Fiber Industry Alliance and Wuhe Differentiation Fiber Co., Ltd., etc. It is the enterprise technology center of Shandong Province, municipal engineering research center for special yarns.







# 知识补给站 3

环再利用。

**丁纶:**是丁二酸丁二醇酯,是一种集合天然纤维和化学纤维共有优点的一种全新的全生物降解纤维。它可以在细菌或者酶的作用下完全分解成水和二氧化碳,对环境无污染,完美的实现了资源的循

# TIPS 9

**Dylon:** It is polybutylene glyool adipate, is a kind of new all-biodegradable fiber combining the common advantages of natural fiber and chemical fiber. It can be completely decomposed into water and carbon dioxide under the action of bacteria or enzymes, which has no pollution to the environment, the perfectly realizes the recycling of resources.

## 抗紫外线吸湿速干纱

Uv-resistant, Moisture Absorption and Quick Drying Yarns

产品规格: 80% 聚酯纤维、20% 莱赛尔纤维; 40 支

关键词: 抗紫外线、吸湿速干

推荐理由:采用赛络紧密纺纱技术,将具有抗紫外线功能的聚酯纤维与莱赛尔纤维混纺,纱线具有持久抗紫外功能、吸湿速干、防暑隔热、触感凉爽的效果。所采用的抗紫外功能性纤维是将 TiO2 制成纳米级颗粒后,与聚酯纤维进行共混纺丝,制成的改性纤维具有良好的抗紫外线功能,对纺织品的色牢度、白度和强度等没有影响。

适用范围:休闲 T 恤, 衬衫等

代表单位: 山东联润新材料科技有限公司; 品牌——"联润"

**产学研:** 国家纺织新材料纱线产品开发基地、国家纺织新材料纱线流行趋势研究中心,建有多个省技术中心等;与天津工业大学、东华大学、青岛大学等国内纺织类高校和科研院所深入交流合作

**认证、标准和专利:** GB/T 19001-2016、ISO9001-2015 质量管理体系、环境管理认证、职业健康管理体系认证;产品生产执行标准 FZ/T12004-2015《涤纶与粘胶纤维混纺本色纱》

#### 指标 Indicator comparison

/+/P = 41	77/15/15 / 1 T 1 00 /00 1		
纱线品种 Yarn varieties			
	检验项目 Test items	检验结果 Test results	
	线密度偏差率 % Yarn density deviation %	-0.8	
	捻系数 Yarn density deviation %	324	
捻度 Twist	捻度 ( 捻 /10cm) Twist (Twist / 10 cm)	84.1	
	捻不匀 % Uneven twist %	0.95	
	单纱断裂强力 /cN Breaking strength of single yarn /cN	446.4	
强力	单纱断裂强度 cN/tex Breaking tenacity of single yarn cN/tex	30.2	
Strength	强力 CV% Strength CV%	6.9	
	断裂伸长率 % Elongation at break %	11.5	
	CVm%	11.46	
Uster 条干	-50%/km	0.5	
Uster Yarn evenness	+50%/km	5	
	+200%/km	12	
毛羽	毛羽指数 H Hairiness index H	2.79	
Hairiness	3mm 毛羽数 (根 /10m) 3mm Hairiness number (Root / 10 m)	9.8	

**Product specifications:** Product specifications: 80% polyester fiber, 20% lyocell fiber; 40 counts

Key words: UV-resistant, moisture absorption and

quick drying

**Reasons for recommendation:** By using Siro compact spinning technology, polyester fiber with anti-ultraviolet function is blended with lyocell fiber. The yarns have long-lasting

anti-ultraviolet function, with effects of moisture absorption and quick-drying, heat-proof and heat insulation, and cool touch. The fibers used with anti-ultraviolet function are nano-sized particles made of TiO2 and blended with polyester fibers. The modified fibers have good anti-ultraviolet function, and there is no effect on color fastness, whiteness, and strength, etc.

Scope of application: T-shirts, shirts, etc.

Representing enterprises: Long Run Textile Co.,Ltd.; brand - "Long Run"

**Industry-university-research:** National Textile New Material Yarn Products Development Base, National Textile New Material Yarn Trend Research Center, and several provincial technology centers; etc. In-depth exchanges and cooperation have been conducted by domestic textile universities and research institutes such as Tianjin Polytechnic University, Donghua University, and Qingdao University

 $\label{eq:continuous} \textbf{Certification, standards and patents: } GB/T 19001-2016, ISO9001-2015 \ Quality \ management system, environmental management certification, occupational health management system certification; production execution standard FZ / T12004-2015 "Polyester and viscose fiber blended natural yarns"$ 



## 紧赛纺柔感弹力纱

## Compact Siro Spinning Soft Stretch Yarns

产品规格: 舒弹丝<sup>⑩</sup> 35%、精梳长绒棉 65%; 40 支

关键词: 手感柔软、回弹性好

推荐理由: 纱线条干、棉结、毛羽等主要指标处于行业领先水平; 织成的舒弹丝面料具有适中的弹性,手感柔软、蓬松、亲肤、优异 的尺寸稳定性、良好的抗皱性、极佳的吸湿快干性等;同时解决了 传统氨纶包芯纱面料的鼓包、疲劳松驰、织造麻烦、露丝等问题。

适用范围: 色织衬衫面料

代表单位: 江苏悦达棉纺有限公司; 品牌——"悦达纺织"

产学研:与盐城工学院、盐城工业职业技术学院以及江南大学在新

产品开发应用方面开展产学研合作,建立企业中心实验室

**认证、标准及专利:** GB/T19001-2016、ISO9001: 2015 质量管

理认证、USTER 认证

**Product specification:** 35% Sorona ®, 65% long–staple combed cotton; 40 counts

**Keywords:** Soft feel and good resilience

**Reasons for recommendation:** The main indicators such as yarn evenness, nep, and hairiness are at the leading level in the industry; the woven Sorona fabric has moderate elasticity, softness and fluffiness, skin-friendly, excellent dimensional stability, good wrinkle resistance, excellent moisture absorption and quick-drying, etc.; at the same time, it solves the problems of bulging, fatigue relaxation, weaving trouble, and silk reveal of traditional spandex corespun yarn fabrics.

Scope of application: Yarn-dyed shirt fabrics

**Representing enterprises:** Jiangsu Yueda Cotton Spinning Co., Ltd; brand – "YDTEX"

**Industry-university-research**: Industry-University-Research Cooperation with Yancheng Institute of Technology, Yancheng Polytechnic College, and Jiangnan University and establish corporate –centered laboratory

 $\label{lem:continuous} \textbf{Certifications, standards and patents: } \texttt{GB} \ / \ \texttt{T19001-2016, } \ \texttt{I809001: 2015}$  quality management certification, USTER certification



生产厂家 Manufacturer	悦达棉纺 YDTex	其它单位 Other companies
品种 Variety		纺舒弹丝 nning Sorona 5 40S 长
纱号偏差% Yarn number deviation %	-0.2	+0.4
强力 cN Strength CN	285	268
强力 CV Strength CV%	8.5	9.2
伸长率 Elongation %	5.9	5.6
条干 CV% Yarn evenness CV%	11.3	12.2
-50%	2	3
+50%	4	6
+140%	50	84
+200%	9	14
毛羽指数 H Hairiness index H	3.08	3.43
捻系数 Twist factor	431	418
纤维含量 Fiber content	舒弹丝 Sorona: 34.6% 棉 Cotton: 65.4%	舒弹丝 Sorona: 35.2% 棉 Cotton: 64.8%
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## 知识补给站

**舒弹丝:** 源自杜邦的一种新型生物质弹性聚酯短纤维,它采用含有 37% 植物性天然可再生资源制备的"Sorona"聚合物,经独特的加工工艺制备而成,其三维螺旋结构和结晶形态赋予了纤维独特的性能。

# TIPS 10

**Sorona:** A new type of biomass elastic polyester staple fiber from DuPont. It uses a "Sorona" polymer made from 37% plant-based natural renewable resources and is prepared by unique processing technology. The structure and crystalline morphology give the fiber unique properties.

## 聚乳酸混纺纱

## Polylactic Acid Blended Yarns

产品规格: 精梳棉聚乳酸纤维⑩混纺纱; 40 支

关键词:柔软耐磨、轻薄、吸湿性好

推荐理由: 手感柔软,强度高、毛羽少、条干均匀度好,应用其制成的针织物纺织品布面光洁、轻薄、柔软、抗起毛起球性能优异、顺滑、耐磨、亮丽、吸湿性好,具有真丝般的手感,是制作高档 T 恤、运动装、衬衫等服装的理想面料。

适用范围: 高档 T 恤、运动装、衬衫等服装

代表单位: 南通双弘纺织有限公司; 品牌——"双弘"

**产学研:**与东华大学、江南大学开展产学研合作,推广新型纤维材料及应用。同时也是中国棉纺织行业协会纱线检测中心,纺织行业新型纤维纺纱技术创

新中心

**认证、标准和专利:** ISO9001、ISO14001、ISO45001 质量管理认证

#### 指标 Indicator comparison

品 种 Variety	条干 cv% Yarn evenness CV%	细节 -50% -50% Snicks	+50% 粗节 +50% Nubs	+200% 棉结 +200% Nep	毛羽 H Hairiness H	强力 cN Strength cN
聚乳酸 40 支 Polylactic acid 40 yarns	11.15	0	4.5	7.5	4.39	333
JC/ 聚乳酸 60/40 40 支 JC / polylactic acid 60/40 40 yarns	12.68	4	27.5	48	3.58	337
Tencel/ 聚乳酸 55/45 60 支 Tencel/ polylactic acid 55/45 60	13.69	8.5	43.5	53	3.96	311
Tencel/ 聚乳酸 55/45 40 支 Tencel/ polylactic acid 55/45 40	12.33	0	14.5	22	4.39	321

Product specification: Combed cotton polylactic acid fiber ® blended yarns; 40 yarns

**Keywords:** Soft and abrasion-resistant, light and thin, good moisture absorption

**Reasons for recommendation:** Soft touch, high strength, less hairiness, and good evenness. The knitted textile fabric made of it is bright and clean, light, soft, anti-pilling, smooth, wear-resistant, bright, and has good moisture absorption. With a silky feel, it is an ideal fabric for making high-end T-shirts, sportswear, shirts and other clothing.

**Scope of application:** T-shirts, sportswear, shirts and other clothing

**Representing enterprises:** Nantong Doublegreat Textile Co., Ltd.; brand – "Double Great"

**Industry–university–research:** Industry–university–research cooperation with Donghua University and Jiangnan University to promote new fiber materials and applications. At the same time, it is also the yarn testing center of China Cotton Textile Association, and the new fiber spinning technology innovation center of the textile industry.

**Certification, standards and patents:** ISO9001, ISO14001, ISO45001 quality management certification

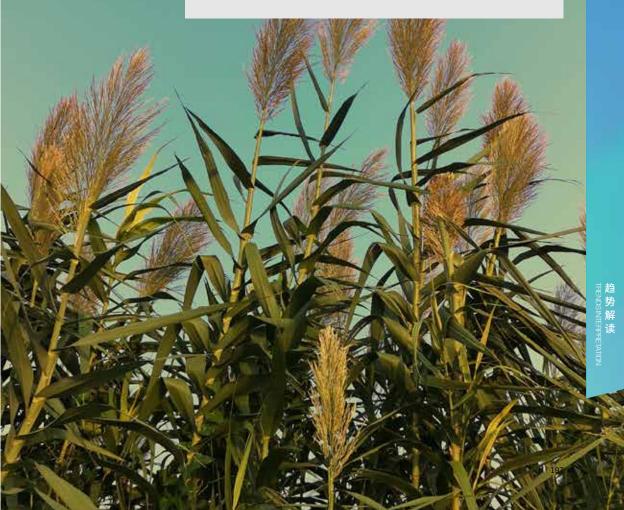


## 知识补给站

**聚乳酸**是由木薯、甜菜、蔗糖、秸秆等原料经微生物发酵而成的小分子乳酸经聚合而成的高分子材料,具有可靠的生物安全性、生物可降解性、环境友好性、良好的力学性能及易于加工成形等优点,符合环保要求和人们对高质量产品的需求,因此聚乳酸在包装、医药、纺织、日用品、农用地膜等行业具有广阔的应用前景。

# TIPS 11

**Polylactic acid:** It is a polymer material obtained by polymerizing small molecule lactic acid produced by microbial fermentation of cassava, sugar beet, sucrose, straw and other raw materials. It has reliable biological safety, biodegradability, environmental friendliness, good mechanical properties, easy processing and other advantages meet the requirements of environmental protection and people's demand for high-quality products. Therefore, polylactic acid has broad application prospects in packaging, medicine, textile, daily necessities, agricultural mulch films and other industries.



## 功能性保健混纺纱

## Functional Health Blended Yarns

产品规格: 莫代尔 50%/ 聚丙烯腈纤维 (腈纶)、30%/ 石墨烯纤维<sup>@</sup> 20%; 50 支

关键词: 亲肤保暖、吸湿透气、防虫抑菌

推荐理由:运用三种不同功能的纤维进行复合,既具有聚丙烯腈纤维(腈纶)的保暖、莫代尔纤维的吸湿舒适等优点、又具有石墨烯纤维独特的远红外、抑菌、抗紫外线、调节人体微循环、促进深度睡眠等功能性特点,纺制的纱线具有良好复合功能性。经拉毛表面处理后,做单染、双染染整工艺后,布面风格独特,色彩五彩斑斓,深受客户欢迎。

适用范围: 医药用品、运动服饰、羽绒服、家用纺织品等

代表单位: 山东超越纺织有限公司

**产学研:**与山东省纺织科学研究院合作开发生物质石墨烯系列混纺纱;山东省纺织产品质量监督检验测试中心,省级"一企一技术创新企业"以及多个市级重点实验室和研究中心

**认证、标准及专利:** ISO9001; 2015 质量管理体系认证; 达到 FZ/T 12051-2016《腈纶粘胶纤维混纺本色纱线》优等品标准; 获得"一种抑菌混纺纱线及其纺纱工艺"等多个专利

**Product specification:** Modal 50% / polyacrylonitrile fiber (acrylic) 30% / graphene fiber; 50 varns

**Keywords:** Skin-friendly and warm, moisture absorption and breathability, insect control and antibacterial

**Reasons for recommendation:** The use of three different functional fibers for compounding, not only has the advantages of polyacrylonitrile fiber (acrylic fiber) to keep warm, modal fiber's moisture absorption and comfort, but also has the unique functional features of graphene fiber such as far-infrared, antibacterial, anti-ultraviolet, and human microcirculation and promoting deep sleep. The spun yarn has good compound functionality. After brushed surface treatment, single dyeing, double dyeing and finishing process, the cloth has a unique and colorful style, which is overwhelmingly welcomed by customers.

**Scope of application:** medical supplies, sportswear, down jackets, home textiles, etc.

Representing enterprises: Shandong Chao Yue Textile Co., Ltd.

**Industry-university-research:** Cooperation with Shandong Textile Institute to develop biomass graphene series blended yarns; Shandong Textile Product Quality Supervision and Testing Center, provincial "one enterprise, one technology innovation enterprise" and several municipal key laboratories and research center

**Certifications, standards and patents:** ISO9001; 2015 quality management system certification; superior product standard of FZ / T 12051–2016 "Acrylic Viscose Fiber Blended Natural Yarns"; multiple patents of "a bacteriostatic blended yarns and its spinning process"

#### 指标 Indicator comparison

检测结论 Test conclusion		该送检样品经检测,所检项目符合 FZ/T12051-2016 (腈纶粘胶纤维混纺本色纱线)优等品技术要求 The samples submitted for inspection have been tested and the tested items meet the superior product technical requirements of FZ/T12051-2016 (blended natural yams)		
	检测项目 Tested items	检测结果 Test results	标准要求 Standard requirement	
	密度偏差率 (%) density deviation (%)	0	± 2.0	
线密度变异系数 (%) Coefficient of variation of yarn density(cN/tex)		1.0	≤ 2.0	
单纱断裂强度 (cN/tex) Breaking tenacity of single yarn (%)		13.2	≥ 12.0	
单纱新装强力变异系数 (%) Coefficient of breaking strength of single yarn CV (%)		8.7	≤ 10.0	
条干均匀度变异系数 (%) Coefficient of variation of evenness (%)		12.5	≤ 13.0	
千米棉结 ( 个 /10 <sup>3</sup> m) 1,000-meter nep (pcs / 10 <sup>3</sup> m)		14	≤ 26	
纤维含量 (%)	再生纤维素纤维 Regenerated Cellulose Fiber	70.4	$(50+20) \pm 1.5$	
Fiber content (%)	腈纶 Polyacrylonitrile fiber (acrylic)	29.6	$30 \pm 15$	

## 知识补给站 12

石墨烯自 2004 年在英国曼彻斯特大学实验室被正式制备以来,受到全世界关注,被誉为"新材料之王"。石墨烯纤维可分为以再生纤维素纤维、锦纶、氨纶、涤纶等纤维为载体的石墨烯改性纤维种类。生物质石墨烯是石墨烯大家族中的一员。它是以玉米芯多孔活性纤维素为原料,采用基团配位组装 (GCA) 法,在热催化条件下经过配位组装、高温碳化、逐步迁移、有序附着、薄层分离等精细加工工艺而得到,属全球首创。生物质石墨烯改性纤维具有远红外、抑菌抑菌、预防螨虫、防静电、抗紫外线、吸湿快干、调节人体微循环、促进深度睡眠等功能性,可用于医药用品、运动服饰、羽绒服、睡袋、棉被、床垫、靠枕、枕芯、披肩等高端纺织品。

# **TIPS 12**

Since graphene was formally prepared in the laboratory of University of Manchester in the United Kingdom in 2004, it has attracted worldwide attention and is known as the "king of new materials". Graphene fibers can be divided into graphene-modified fibers based on fibers such as regenerated cellulose fibers, nylon, spandex, and polyester. Biomass graphene is a member of the large graphene family. It uses corn cob porous active cellulose as raw material, adopts group coordination assembly (GCA) method, and undergoes fine assembly processes such as coordination assembly, high-temperature carbonization, gradual migration, orderly adhesion, and thin layer separation under thermal catalytic conditions, which is pioneering in the world. Biomass modified graphene fiber is far-infrared, bacteriostatic, anti-mite, antistatic, anti-ultraviolet, moisture absorption and quick-drying, and has functions of regulating human microcirculation and promoting deep sleep. It can be used in high-end textiles such as medical supplies, sportswear, down jackets, sleeping bags, quilts, mattresses, pillows, pillow cores, shawls and so on.

## 涡流纺莱赛尔混纺纱

## Vortex Spinning Lyocell Blended Yarns

产品规格: 莱赛尔 / 棉 / 铜氨纤维<sup>®</sup> 25/50/25; 20-50 支

关键词:吸湿透气、丝滑挺括

推荐理由: 涡流纺具有高速、高效和高自动化的特点。采用涡流纺纱技术<sup>®</sup>,纱线具有特殊的包缠结构,纱线结构比较膨松,因而其染色性、吸浆性、透气性较好;纱线的毛羽、抗起球性和耐磨性较好。织物具有良好的吸湿性和透气性,轻柔滑爽,悬垂性和光泽度好。

适用范围:高档丝织或针织物

代表企业: 浙江双盾纺织科技有限公司; 品牌——"双盾"、"沃特丝" 产学研:与东华大学、浙江纺织服装职业技术学院开展科研合作,省部级以上工程中心、市级纺织服装重点实验室、研发开发中心 认证、标准及专利:获得 ISO9001 和 ISO14001 质量管理认证;参与制定并应用标准 T/ZZB 0453-2018《涡流纺莱赛尔、棉、铜氨混纺本色纱》

**Product specification:** Lyocell / Cotton / Copper ammonia fiber ® 25/50/25;20-50 yarns

Keywords: Moisture absorbing and breathable, silky stiff

**Reasons for recommendation:** Vortex spinning is characterized by high speed, high efficiency and high automation. If the vortex spinning technology is adopted (14), the yarn has a special wrapping structure, whose structure is relatively bulky, so its dyeability, pulp absorption, and air permeability are good; the yarns has better hairiness, pilling resistance and abrasion resistance. The fabric has good moisture absorption and breathability, softness and smoothness, good drapability and gloss.

Scope of application: High-grade silk or knitted fabrics.

**Representing enterprises:** Zhejiang Shuangdun Textile Technology Co., Ltd.; brands – "ShuangDun", "WTS"

**Industry-university-research:** Research cooperation with Donghua University, Zhejiang Fashion Institute of Technology, provincial and ministerial engineering centers, key laboratories of municipal textile and apparel, research and development centers

**Certifications, standards and patents:** ISO9001 and ISO14001 quality management certifications; participation in the development and application of the standard T / ZZB 0453–2018 "Vortex spinning lyocell, cotton, copper ammonia blended natural yarns"

	-	-				
7			-		-	-
	指标 Indicator comparison					
	项目 Item	21S 指 indicator	21S 实际 actual	32S 指 indicator	32S 实际 actual	
	线密度偏差率 (%) Yarn density deviation (%)	± 2.0	+1	± 2.0	0.8	
	线密度变异系数 CV/% Coefficient of variation of yarn density CV/%	≤ 1.5	1.0	≤ 1.5	1.3	,
	条干均匀度变异系数 Coefficient of variation of yarn evenness	≤ 13.5	13.24	≤ 16.0	15.88	5
	强力变异系数 CV/% Coefficient of variation of strength CV/%	≤ 8.0	8.0	≤ 11.0	10.5	
	千米棉结 (+200%) 1,000-meter nep (+200%)	≤ 200	200	≤ 420	411	-
190	细节 (-50%) Snick(-50%)	≤ 5	0	≤ 50	47	1
	粗节 (+50%) Nub (+50%)	≤ 90	78	≤ 200	192	
	平均强力 (cN) Average strength (cN)	≥ 380	365	≥ 250	240	
1	回潮率 (%) Moisture regain (%)	≤ 8.0	8	≤ 8.0	8	
	3mm 毛羽指数 3 mm hairiness index	3.25	0.45	3.25	0.45	



# 知识补给站 13

**铜氨纤维**是一种再生纤维素纤维,取自棉花种子周边的绒毛,100% 纤维素纤维,它是将棉短绒等天然纤维素原料溶解在氢氧化铜或碱性铜盐的浓氨溶液内,配成纺丝液,在凝固浴中铜氨纤维素分子化学物分解再生出纤维素,生成的水合纤维素经后加工即得到铜氨纤维。

14

**涡流纺和转杯纺区别**:一般环锭纺纱机每台机器的发尘量超过 90mg/s,而 涡流纺的每台机器的发尘量不超过 50mg/s,在控制好生产温湿度的前提下, 加强车间回风的巡回次数; 涡流纺设备优势充分体现出环保优势, 改善了环境。

# **TIPS 13**

**Copper ammonia fiber** is a kind of regenerated cellulose fiber, taken from the fluff around cotton seeds, a 100% cellulose fiber. Natural cellulose raw materials such as cotton linter are dissolved in a concentrated ammonia solution with copper hydroxide or alkaline copper salt, and a spinning solution is prepared. In the coagulation bath, the copper ammonia cellulose molecular chemical is decomposed to regenerate cellulose, and the generated hydrated cellulose is processed to obtain copper ammonia fibers.

14

**The difference between vortex spinning and rotor spinning:** The dust emission of each ring spinning machine exceeds 90 mg / s, while the dust emission of each machine of vortex spinning does not exceed 50 mg / s. Under the premise of controlling the production temperature and humidity, the frequency of return air in the workshop is strengthened; vortex spinning equipment fully reflects the advantages of environmental protection and improves the environment.

# 再生纤维长丝高弹纱

High Elastic Yarns of Regenerated Fiber Filament

产品规格: PBT 和再生纤维生物基长丝捻线; 44 支

关键词:高弹、尺寸稳定

推荐理由: 纱线具有手感柔软、光滑凉爽、透气、抗静电 以及高弹保型效果,成衣后其尺寸稳定性、耐久性、亲肤 性均发挥到了极致,穿着舒适、健康环保更是该纤维制品 优点所在。该产品选用再生纤维素纤维生物基长丝作为主 要材料,再配以PBT纤维,通过独特的生产制造工艺,摒 除纤维自身缺点的同时,将两种差别化纤维的优点充分发 挥出来。

适用范围: 高端针织服装, 尤其适用于女性针织时装领域

"博洋"宝莱纱

产学研:与北京服装学院、华东理工大学共同开展产学

研合作;建立了企业技术研发中心

**认证、标准及专利:**获得 ISO9001:2015 质量 管理体系认证, 常州市高新技术产品认定证, 拥有专利 ZL 2016 2 1486508.8《倍捻、并 丝一体机的单根断纱后自动切断装置》、ZL 2016 2 1486521.3《初捻、并丝合并装置》



指标 Indicator comparison

项目 指标 Item 单丝粘涤 PBT 纤维复合密度 120D

Monofilament viscose polyester PBT fiber comp osite density 单线断裂强力 Single yarn breaking strength

单线断裂强力变异系数

Coefficient of variation of single yarn breaking strength

单线断裂伸长率

Elongation at break of single varn 单线断裂伸长率变异系数

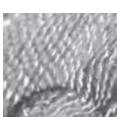
Coefficient of variation of elongation at break of single yarn

≥ 480N

优等品≤3% 合格品≤5% Superior product <3% Qualified product <5%

优等品≥22% 合格品≥18% Superior product ≥22% Qualified product ≥18%

优等品≤ 4CV 合格品≤ 7CV Superior product ≤ 4CV Qualified product ≤ 7CV





 $\textbf{Product specification:} \ \mathsf{PBT} \ \mathsf{and} \ \mathsf{regenerated} \ \mathsf{fibers} \ \mathsf{bio-based} \ \mathsf{filament} \ \mathsf{twist}; \ \mathsf{44} \ \mathsf{yarns}$ 

**Keywords:** High elasticity and dimension stability

**Reasons for recommendation:** The yarns are soft, smooth and cool, breathable, antistatic and have high elasticity retention effects. After the garment is finished, its dimensional stability, durability and skin–friendly properties are maximized. Comfortable, healthy and environmentally friendly are the advantages of this fiber products. This product uses regenerated cellulose fiber bio–based filament as the main material, and then combines PBT fiber. Through the unique manufacturing process, the advantages of the two differentiated fibers are brought into full play while the shortcomings of the fiber itself are eliminated.

**Scope of application:** High-end knitted garments, especially for women's knitted fashion **Representing enterprises:** Hi–Tech Polyace Biobased Fiber Co., Ltd.; brand – "Boyang" Baolai Yarn

**Industry-university-research:** Cooperation with Beijing Institute of Fashion Technology and East China University of Science and Technology to establish industry-university-research cooperation; an enterprise technology research and development center has been established.

**Certification, standards and patents:** It has obtained ISO9001: 2015 quality management system certification, Changzhou high-tech product certification; patents of ZL 2016 2 1486508.8 "Automatic cutting device after single yarn break of double twist and yarn integration machine", ZL 2016 2 1486521.3 "Initial twist and yarn combination device"



## 防护用弹力纱

## Stretch Yarns for Protection

**产品规格:** 间位芳纶、氨纶

关键词: 弹力、阻燃

推荐理由: 纱线做出的阻燃防静电面料,能够满足阻燃防静电性能标准要求,舒适

性明显提升。

适用范围: 特种防护服装

代表企业:烟台泰和新材料股份有限公司;品牌——"泰美达"

指标: 阴燃续燃时间 < 2S, 无熔融滴落、耐温性能优异, 可在 -196℃ -204℃长期使用。 **质量认证与产学研:** 单位质量管理体系通过 IATF16949\ISO9001\ OEKO-TEX 100 认证。拥有国家芳纶工程技术研究中心、省部级以上科技中心、省部级以上工程中心。 与东华大学、北京服装学院等国内外高校、科研院所进行技术合作与研究

**Product specification:** Meta aramid, spandex

Key words: Elasticity, flame retardant

**Reasons for recommendation:** The flame retardant and antistatic fabric made of yarns can meet the requirements of flame retardant and antistatic performance standards, and the comfort is significantly improved.

**Scope of application:** Special protective clothing

Representing enterprises: Yantai Tayho New Materials Co., Ltd.; brand – "Tametar"

**Indicators:** The smoldering afterglow time is less than 2S; there is no melting dripping, and the temperature resistance is excellent. For Long-term use at -196°C to 204°C.

**Quality certification and industry-university-research:** The unit quality management system has passed IATF16949 certification. It has a national aramid engineering technology research center, provincial and ministerial-level science and technology centers, as well as provincial and ministerial-level engineering centers. Technical cooperation and research have been conducted with Donghua University, Beijing Institute of Fashion Technology, and other domestic and foreign universities and research institutes.

## 抑菌再生纤维素纤维纱

## Antibacterial Regenerated Cellulose Fiber Yarns

产品规格: 50% 优可丝®安泰贝®抑菌纤维®/50% 再生纤维素纤维

关键词: 抑菌

推荐理由:通过注射纺丝技术将活性抑菌物质均匀分散在粘胶短纤表面及内部,对细菌、真菌及病毒等微生物具有抑制作用。纱线强力、疵点及毛羽等指标的性能优越,所制备的面料洗涤 50 次后仍然保持极佳的抑菌效果,衣物保持气味清新。

适用范围:家居、贴身服饰、户外用品、美容面膜、医用防护品

代表企业: 林茨(南京) 粘胶丝线有限公司; 品牌── "优可丝®安泰贝®"

**认证、标准和专利:**通过国家 FZ/T 73023-2006 抑菌针织品 (AAA) 标准检测;达到日本 JIS L 1902-2015 的要求;获得国家针织产品质量监督检验中心检测,FZ/T73023-2006 抑菌针织品标准《GB 31701-2015 婴幼儿及儿童纺织产品安全技术规范 (A 类)》;日本纤维评价技术协会 SEK 标志纤维制品认证基准。

#### 指标 Indicator comparison

	项目 Variety		标准值 Standard value	实测值 Measured value
抗菌性 Bacteria restraint	金黄色葡萄球菌抑菌率 Staphylococcus aureus antibacterial rate	%	≥ 80	96.0
	大肠杆菌抑菌率 Escherichia coli antibacterial rate	%	≥ 70	92.3
	白色念珠菌抑菌率 Candida albicans antibacterial rate	%	≥ 60	87.2

**Product specification:** 50% EcoCosy<sup>®</sup> Antaibei<sup>®</sup> antibacterial fiber <sup>®</sup> / 50% regenerated cellulose fiber

Keywords: Antibacterial

**Reasons for recommendation:** The active antibacterial substance is evenly dispersed on the surface and inside of the viscose staple fiber with injection spinning technology, and it has an inhibitory effect on microorganisms such as bacteria, fungi and viruses. The indicators of the yarns such as strength, defects and hairiness are excellent. The fabrics prepared after 50 washings still maintain excellent antibacterial effect, and the clothes keep fresh smell.

**Scope of application:** Home, intimate apparel, outdoor products, beauty masks, medical protective products

**Representing enterprises:** Linz (Nanjing) Viscose Yarn Co., Ltd.; brand – EcoCosy ® Antibacterial Fibre

**Certification, standards and patents:** It has passed the national FZ / T 73023–2006 antibacterial knitwear (AAA) standard test; it has reached the requirements of Japanese JIS L 1902–2015; it has passed the test of the national knitted product quality supervision and inspection center and obtained antibacterial knitwear standards "GB 31701–2015 Safety Technical Specification on Textile Products for Infants and Children (Class A)", and SEK Marked Fiber Product Certification Standard of Japan Fiber Evaluation Technology Association.

## 仿毛色纺纱

## Wool-like Colored Spun Yarn

**产品规格:** 70% 聚酯纤维(涤纶) 30% 再生纤维素纤维(粘胶); 32 支

关键词: 抗起毛起球、挺括易打理、色牢度高

推荐理由:该产品通过紧密赛络纺工艺,在棉纺设备上将中长纤维纺制的聚酯纤维(涤纶)与再生纤维素纤维(粘胶)混纺,生产出高档仿毛纱线,通过改进工艺,既可做针织纱,柔软亲肤,亦可做机织纱。产品首选环保友好的色母粒<sup>®</sup>,纤维通过色纺纱专业的拼色技术实现了面料百万米无色差的需求。

适用范围: 机织、针织领域, 西服等

代表企业: 汶上如意技术纺织有限公司;品牌——"天容"

产学研:与东华大学、西安工程大学、武汉科技学院、北京服装学院以及澳大利亚

联邦科学院建立科研合作。是山东省企业技术中心、省部级以上科技中心

## 认证、标准和专利:

ISO9001、ISO14001 质量管理;GB/T28001-2011;OHSAS18001:2007;产品参考标准 FZ/T12022-2009《涤纶与粘胶混纺色纺纱》。 获得"一种新式 AB 纱及其纺纱方法"、"一种梳棉机盖板斩刀针布包覆装置"等专利

**Product specification:** 70% PET fibers (polyester) 30% regenerated cellulose fibers (viscose): 32 counts

**Keywords:** Anti-pilling, crisp and easy care, high color fastness

Reasons for recommendation: The product is blended with PET fibers (polyester) spun by medium length fibers and regenerated cellulose fibers (viscose) on cotton spinning equipment through close siro spinning process to produce high-grade wool-like yarn. By improving the process, it can not only be used as knitting yarn that is soft and skin-friendly, but also weaving yarn. The first choice for the product is the environmentally friendly color master batch<sup>®</sup>, and the fiber can meet the needs of no color difference for millions of meters through the professional color matching technology of colored spun yarn.

**Scope of application:** Fields of weaving and knitting, western–style clothes, etc.

Representing enterprises: Wenshang Ruyi Technology Textile Co.,Ltd; Brand – "Tianrong"

**Industry-university-research:** Scientific research cooperation with Donghua University, Xi'an Polytechnic University, Wuhan University of Science and Technology, Beijing Institute of Fashion Technology and Commonwealth Scientific and Industrial Research Organization has been established. It is the Enterprise Technology Center of Shandong Province and the Science and Technology Center at or above the provincial and ministerial level.

**Certification, standards and patents:** ISO9001, ISO14001 Quality Management; GB/T28001-2011; OHSAS18001:2007; Product Reference Standard FZ/T12022-2009 Blending Colored Spun Yarn of Polyester and Viscose.Patents such as "A New Type of AB Yarn and Its Spinning Method", "A Covering Device of Cutting Die and Card Clothing for Carding Machine Cover Plate", etc. has been obtained.



#### 指标 Indicator comparison

Main Quality Index and Performance (Compared with Conventional Product)					
项目 Item	涤粘仿毛色纺纱 Wool-like colored spun yarn	粘胶色纺纱 Conventional regenerated cellulose fibers colored spun yarn	标准要求 Standard requirements		
抗起毛气球 (级) Anti-pilling (Level)	4	3	≥3		
单纱断裂强力变异系数 (%) Variation coefficient of breaking strength of single yarn (%)	6.6	6.85	≤ 8.0		
百米质量变异系数 (%) Variation coefficient of 100-meter quality (%)	1.8	1.98	≤ 2.0		
条干均匀度 (%) Yarn evenness (%)	11.06	15.05	≤ 16.4		
千米棉结 (+200% 粒 /km) 1,000-meter nep (+200% granule/km)	15	28	≤ 100		

1

主要质量指标与性能(与常规产品对比)



明显色结 (粒 /100m) Apparent color knot (granule/100m)

# **知识补给站 15**

色母粒: 是一种新型高分子材料专用着色剂,亦称颜料制备物。色 母粒由颜料或染料、载体和添加剂三种基本要素所组成,是把超 常量的颜料均匀载附于树脂之中而制得的聚集体,可称颜料浓缩物, 所以它的着色力高于颜料本身。加工时用少量色母粒和未着色树脂 掺混,就可达到设计颜料浓度的着色树脂或制品。

5

# **TIPS 15**

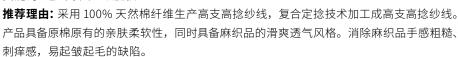
≤ 6

Color master batch: refers to a new kind of special colorant for high polymer materials, also known as pigment preparation. Color master batch is composed of pigment or three basic elements as dye, carrier and additive. It is a kind of aggregate made by uniformly loading super constant pigment into resin, which can be called pigment concentrate, so its tinctorial strength is higher than pigment itself. During processing, through blending with a small amount of color master batch and uncolored resin, the colored resin or product with the designed pigment concentration can be realized.

## 仿麻滑爽纯棉纱

## Linen-like Smooth Pure Cotton Yarn

**产品规格:** 100% 棉; JC50 支 **关键词:** 透气凉爽、细腻飘逸



适用范围:中高端服饰、家居领域

**代表企业:** 无锡一棉纺织集团有限公司;品牌── "TALAK"

**产学研:**与东华大学、江南大学、哈尔滨工程大学等院校进行合作;下设纤维新材料应用及新产品研发,纺织科技情报及新技术、纺织智能制造、纺织绿色生产、中埃纺织技术合作五个研究室

**认证、标准及专利:** ISO9001 质量体系认证、环保认证等



**Product specification:** 100% Cotton; JC50 counts **Keywords:** Breathable, cool, delicate and elegant

**Reasons for recommendation:** High count and high twist yarn are produced by 100% natural cotton fiber, with processing of composite twist setting technology. The product has the original skin-friendly softness of raw cotton and the smooth and breathable style of hemp fabric, eliminating the defects of rough hand feeling, itchy sense and easy to wrinkle and fluff of hemp fabric.

**Scope of application:** Fields of middle and high–end clothing and home furnishings **Representing enterprises:** Wuxi No. 1 Cotton Mill Textile Group Co., Ltd.; Brand – "TALAK"

**Industry-university-research:** cooperation with Donghua University, Jiangnan University, Harbin Engineering University, and other colleges and universities has been conducted; there are five research rooms, namely, fiber new material application and new product research and development, textile science and technology intelligence and new technology, textile intelligent manufacturing, textile green production, and China–Egypt textile technology cooperation

**Certification, standard and patent:** ISO9001 Quality System Certification, Environmental Protection Certification, etc.

## 长绒棉高支纱

## Long Staple Cotton High Count Yarn

产品规格及成分: 100% 长绒棉; 环锭纺精梳 60-80 支

关键词: 光洁、抗起毛起球

**推荐理由:** 纱线条干均匀、强力高、毛羽少;面料纹路清晰、抗起毛起球性好、手感柔软、耐用等。长绒棉高支纱从原料头着手,摸索与制订含醣棉的使用方法,配合适宜的温湿度控制,不断优化各车间工艺参数,在自络捻结方面通过不断的优化捻结块型号、优化退捻、加捻参数,使得捻结外观得以改善提高。

适用范围: 高档色织面料及针织面料

代表企业:河北圣源纺织有限公司;品牌——"宇彤"

产学研:与河北科技大学、天津工业大学纺织科学与工程学院签有产学研合作协议。现为

河北科技大学纺织服装学院研究生培训基地

#### 指标 Indicator comparison

14 Mindicator comparison					
指标 Index	JC6O(100% 细绒棉) JC6O(100% Fine staple cotton)	JC60(100% 长绒棉) JC60(100% Long staple cotton)	JC80(100% 细绒棉) JC80(100% Fine staple cotton)	JC80(100% 长绒棉) JC80(100% Long staple cotton)	
百米重量偏差 100-meter weight deviation	1.34	1.84	1.25	1.16	
重量 CV% Weight CV%	1.5	1.6	1.7	1.5	
回潮率 % Moisture regain%	6.5	6.4	6.1	6.3	
条干 CV% Evenness CV%	12.31	11.58	13.3	12.53	
CVb%	1.8	1.7	2.4	2.3	
细节 (-50%) /km Snick (-50%)/km	3	0	11	3	
细节 (+50%) /km Snick (+50%)/km	9	3	17	8	
棉结 (+140%) /km Nep (+140%)/km	188	55	465	115	
棉结 (+200%) /km Nep (+200%)/km	36	13	50	27	
毛羽 H 值 Hairiness H value	2.84	2.35	2.65	2.34	
捻度 (1/10cm) Twist (1/10cm)	121.6	118.3	142.5	138.6	
捻度 CV Twist CV	3.3	3.2	3.5	3.4	
单纱强力 cN Single yarn strength cN	187.9	262.7	133.9	188.5	
断裂强度 Breaking tenacity cN/tex	20.9	29.3	21 2	27.7	
强力 CV% Strength CV%	7.3	7.1	10	8.5	
最大强力 cN Maximum strength cN	220.3	302	166.9	224.2	
最小强力 cN Minimum strength cN	153.5	2155	108.1	1518	
断裂伸长率 % Elongation at break %	5.63	5.75	4.71	5.63	
伸长 CV% Elongation %	9.2	7.45	10.74	8.24	



**Product specification and ingredients:** 60–80 counts of ring spinning combed; 100% long staple cotton

Keywords: Bright and clean, anti-pilling

**Reasons for recommendation:** The yarns are of evenness, high strength and less hairiness; the fabric has clear texture, good anti–pilling nature, with soft hand feeling and durability. Starting from the raw material, the long staple cotton high count yarn explores and formulates the use method of sugar containing cotton, and cooperates with the appropriate temperature and humidity control to constantly optimize the process parameters of each workshop. In the aspect of self–winding twist knot, the appearance of twist knot can be improved by continuously optimizing the type of twist knot block, optimizing the parameters of untwisting and twisting.

**Scope of application:** High-grade yarn-dyed fabrics and knitted fabrics

**Representing enterprises:** Hebei Shengyuan Textile Dye & Print Co., Ltd.; Brand – "Yutonq"

**Industry-university-research:** with industry-university-research cooperative agreements with Hebei University of Science and Technology and TianGong University—School of Textile Science and Engineering. It is the current postgraduate training base of Hebei University of Science and Technology—College of Textile and Garment.

## 涡流纺再生纤维素纤维纱

## Vortex Spinning Regenerated Cellulose Fiber Yarns

产品规格: 100% 细旦再生纤维素纤维(粘胶)(1.0tex\*38mm)纤维;80支

关键词: 耐磨、透气舒适

推荐理由: 纱线以细旦再生纤维素纤维为原料,采用涡流纺纱技术,纺出的纱线具有良好的吸湿性,符合人体皮肤的需求,还具有光滑凉爽、透气、抗静电、防紫外线、色彩绚丽、染色牢度好的特点。其织出的布料具有耐磨性高、耐洗涤、抗起球等特性。

适用范围: 服装面料、家纺面料、产业用织物产品

代表企业: 吴江京奕特种纤维有限公司

**产学研:**与江南大学、兰精公司、苏州新东南纺织公司开展合作;拥有吴江京奕特种纤维技

术中心、省部级以上科技中心

**认证、标准及专利:** 获 ISO4001 环境管理体系,ISO9001 质量管理体系认证;获得涡流纺混纺纱生产工艺(ZL 2015 1 0440589.1)等三项发明专利;一种涡流纺纱线用收卷装置(ZL 2017 2 1512873.6)等多项实用新型专利



)		
项目名称 Project Name	单位 Unit	指标 Index
线密度偏差率 D eviation rate of linear density	%	0.7
线密度变异系数 Coefficient of variation of linear density	%	0.8
単纱断裂强度 Single yarn fracture strength	cN/tex	13.8
単纱强力变异系數 Coefficient of variation of single yarn strength	%	9.9
条干均匀度变异系数 CVm Coefficient of variation of evenness	%	16.3
千米棉结 Ncps/Km(+200%) 1,000-meter nep(+200%)/km	个/Km PC/Km	118
千米细节 Thin/Km(-50%) 1,000-meter snick (-50%)/km (-50%)	个/Km PC/Km	106
千米粗节 Thick/Km(+50%) 1,000-meter nub (+50%)/km (+50%)	个/Km PC/Km	152
毛羽值 H Hairiness value H		2.75
単纱断裂伸长 Single yarn breaking elongation	%	6.8
耐摩性 Wear resistance	分 Min	18
回潮率 Moisture regain	%	11.3



**Product specification:** 100% Fine denier regenerated cellulose fibers (viscose) (1.0tex\*38mm) fibers; 80 counts

Key words: Durable, breathable and comfortable

**Reasons for recommendation:** Taking fine denier regenerated cellulose fibers as raw materials, the vortex spinning technology is adopted for the yarn. The spun yarn has good moisture absorption, meets the needs of human skin, with the characteristics of smooth, cool, breathable, antistatic, UV resistant, gorgeous color and good color fastness. The spun fabric has the characteristics of high wear resistance, washing resistance and pilling resistance.

**Scope of application:** Clothing fabric, home textile fabric, industrial fabric products

Representing enterprises: Wujiang Jingyi Special Fiber Co., Ltd.

**Industry-university-research:** Cooperation with Jiangnan University, Lenzing, and Suzhou Xindongnan Textile Technology Co., Ltd. has been carried out; it possesses Wujiang Jingyi Special Fiber Technology Center and Science and Technology Centers at or above provincial and ministerial level

**Certification, standards and patents:** Certifications of National ISO911 Quality System, ISO4001 Environmental Management System, ISO9001 Quality Management System have been obtained; three patents for invention such as Vortex Spinning Blended Yarn Production Process (ZL 2015 1 0440589.1); and various utility model patents such as A Wrap-up Device for Vortex Spinning Yarn (ZL 2017 2 1512873.6) have been obtained.

# HENDSINTERPRETATION AND SINTERPRETATION

## 高支细旦再生纤维素纤维纱

## High Count Fine Denier Regenerated Cellulose Fiber Yarn

**产品规格及成分:** 100% 超细旦再生纤维素纤维(粘胶纤维)(1.0dtex\*38mm); 100 支/120 支

关键词:细腻亲肤、光洁挺括

**推荐理由:** 原料选自天然绿色纤维,原料生物质、生产过程绿色环保、废弃物可完全降解回归自然,适纺性好,在高支纱方面其成纱的条干、强力、毛羽等指标更佳。采用其生产的包芯纱,毛羽较少,质量可媲美紧密赛络纺产品,织造效率较高。

适用范围: 适用于针织、梭织、经编和各种混纺织物用纱

代表企业: 福建新华源纺织集团有限公司; 品牌——"Sadaer"

产学研:新华源与辽东学院联合成立"新材料纺织应用研究院";拥有省级技术中心

**认证、标准及专利:** ISO9001-2000 国际质量管理体系认证,参照执行标准 FZ/T12003-2014 《粘胶纤维本色纱线》

#### 指标 Indicator comparison

Sadaer 系列赛络紧密纺检验报告 Inspection Report on Sadaer Series Tight Siro Spinning						
检验项目 Items for inspection	Sadaer 100S 赛络紧密纺 Sadaer 100S Siro compact spinning	Sadaer 120S 赛络紧密纺 Sadaer 120S Siro compact spinning				
单纱强力变异系数 (CV%) Coefficient of variation of single yarn strength (CV%)	9.4	10.3				
单纱强力 (cN) Single yarn strength (cN)	89.3	74.4				
单纱断裂强度 (cN/tex) Single yarn breaking strength (cN/tex)	15.3	15.2				
重量偏差 (%) Weight deviation (%)	+0.4	+0.6				
条干均匀变异系数 (CV%) Coefficient of variation of evenness (CV%)	12.60	13.8				
千米细节 (-50%) 1,000-meter snick (-50%)	3	10				
千米粗节 (+50%) 1,000-meter Nub (+50%)	27	28				
千米棉结 (+200%) 1,000-meter Nep (+200%)	78	68				

**Product specification:** 100% Super fine denier regenerated cellulose fibers (viscose fibers) (1.0dtex\*38mm); 100 Counts/120 Counts

**Key words:** Fine and skin-friendly, bright and clean and crisp

**Reasons for recommendation:** Raw materials are selected from natural green fibers. Raw material biomass and production process is green and environmentally friendly, and waste can be completely degraded back to nature, with good spinnability, and better indicators of its yarn evenness, strength, hairiness, etc. in terms of high-count yarn.

strength, naminess, etc. in terms of high count yarn.

**Scope of application:** Suitable for knitting, tatting, warp knitting and various blended fabric yarns

**Representing enterprises:** Fujian Xinhuayuan Textile Group Co., Ltd.; Brand – "Sadaer"

**Industry-university-research:** Xinhuayuan and Eastern Liaoning University jointly found the "New Material Textile Application Research

Institute"; it has a provincial technology center

Certification, standard and patent: ISO9001–2000 International Quality

Management System Certification, implementation by reference to FZ/T12003-2014 Viscose Fiber Natural Color Yarn

## 莱赛尔短纤纱

Lyocell Staple Fiber Yarn

**产品规格:** 莱赛尔 / 精梳棉 50/50; 32 支 /40 支

**关键词:**强度高、吸湿透气、柔软光洁

推荐理由: 纱线以莱赛尔纤维为原料再进行纺丝生产,其过程无有害物质排放,对环境无污染,纺丝溶剂回收率可达 99.5%。本系列产品在紧密纺细纱机上喂入两根保持一定间距的粗纱,发挥赛络纺和紧密纺的技术优势,提升细纱纺制品质,单纱强力高,结构紧密,耐磨性好,有害毛羽极少,纱线光洁。

适用范围: 高档针织纺织品和色织布

代表企业:福建长源纺织有限公司;品牌——"皓光"

**产学研:**与中国纺织科学研究院合作开展新溶剂法莱赛尔 纤维的研发和技术应用,是省部级以上工程中心、福建省

级企业技术中心、福建省级工程技术研究中心

**认证、标准及专利:** 获 ISO14001; OHSAS18001 认证; 主要依据 FZ/T 12013-2014 莱赛尔纤维本色纱线标准生产; 拥有实用新型专利: 螺旋气流紧密纺生产装置 (ZL 2017 20213978.5)

## 指标 Indicator comparison

项目 Item	单位 Unit	紧赛莱赛尔 (100%) 纱 40s Compact Lyocell (100%) yarn 40s	紧赛精梳棉 50/ 莱赛尔 50 混纺 纱 32s Compact combed cotton 50 / Lyocell 50 blended yarn 32s	紧赛精梳棉 70/ 莱赛尔 30 混纺 纱 40s Compact combed cotton 70 / Lyocell 30 blended yarn 40s	紧赛精梳棉 70/ 莱赛尔 30 混纺 纱 32s Compact combed cotton 70 / Lyocell 30 blended yarn 32s
单纱断裂强度 Single yarn breaking strength	cN/tex	24.1	20.1	18.7	18.9
单纱断裂强力变异系数 Coefficient of variation of single yarn breaking strength	%	6.1	6.2	6.1	6
条干均匀度变异系数 Coefficient of variation of evenness	%	11	10.1	11.5	10.5
线密度偏差率 Linear density Deviation rate	%	-1.4	-0.5	0.7	1.1
毛羽指数 Hairiness index	根 /m one/m	5.02	3.88	3.96	4.77
捻度 Twist	捻/m Twist/m	893	769	927	803



**Product specification:** Lyocell / Combed Cotton50/50; 32 counts /40 counts

**Key words:** High strength, moisture absorption and air permeability, soft and bright and clean

**Reasons for recommendation:** The yarn is made of Lyocell fiber as the raw material for spinning production, there are no harmful substances and no pollution to the environment during the process, and the recovery rate of spinning solvent can reach 99.5%. The series of products feeds two roving with a certain distance on the compact spinning frame, which takes advantage of the technical advantages of siro spinning and compact spinning to improve the spinning quality of single yarn to be of high strength, compact structure, good abrasion resistance and rare harmful hairiness, being bright and clean.

**Scope of application:** High-grade knitted textiles and yarn-dyed fabrics

**Representing enterprises:** Fujian Changyuan Textile Co., Ltd.; Brand — "Haoguang" and "Changyuan"

Industry-university-research: It cooperates with China Textile Academy in the R&D and technical application of new solvent Lyocel fiber. It is an engineering technology center at or above the provincial level, a Fujian Provincial Enterprise Technology Center, and a Fujian Provincial Engineering Technology Research Center

**Certification, standards and patents:** Obtain IS09001; IS014001; OHSAS18001 Certification; it is mainly produced according to the standard FZ/T 12013–2014 Lyocel fiber natural yarn, and has utility model patent: Spiral Air Tight Spinning Production Device (ZL 2017 2 0213978.5)

### 竹纤维混纺弹力纺纱

### Bamboo Fiber Blended Stretch Yarn

产品规格: 50% 竹纤维 / 20% 聚酯纤维 (涤纶)/30% 生物质聚酯纤维 (涤纶);50 支

关键词:高弹、挺括

推荐理由: 纱线具有高弹性、回复性佳;纱线纺制的面料纹路清晰,布面平整不易起皱,手感柔软而挺括,制成的成衣舒适贴服,衣着关键部位(如肘部、臀部、膝盖)

不易起包变形,且常温染色,自然环保,亲肤性好,实现可持续发展。

适用范围: 春夏衬衣

**代表企业:** 无锡四棉纺织有限公司; 品牌——"球鹤" **产学研:** 与江南大学、香港理工大学有合作科研项目

### 指标 Indicator comparison

项目 Item	单位 Unit	测试值 Test value
缕纱重量变异系数 Coefficient of variation of yarn weight	CV%	1.2
极差 Deviation of yarn weight	%	4.5
缕纱重量偏差 Lyo	%	1.1
单纱 (线)断裂强度 Single yarn (line) breaking strength	cN/tex	18.7
最低强力 Minimum strength	cN	172.8
断裂伸长 Breaking elongation	%	11.5
单纱(线)断强变异系数 Coefficient of variation of single yarn (line) breaking strength	CV%	10.6
条干变异系数 Coefficient of variation of evenness	CV%	10.3
条干各管间变异系数 Coefficient of variation of evenness tubes	CVb%	4.09
千米细节 -50% 1,000-meter snick(-50%)	个/手 Piece /km	0
千米细节 +50% 1,000-meter snick(+50%)	个/千 Piece/km	5
千米棉结 +200% 1,000-meter nep (+200%)	个/千 Piece /km	28
千米棉结 +140% 1,000-meter nep (+140%)	个/手 Piece /km	125
毛羽 H Hairiness H		251
毛羽 Hairiness	↑ (2mm) Piece (2mm)	30

**Product specification:** 50 counts of 50% bamboo fiber 20% PET fiber (polyester) 30% biomass PET fiber (polyester)

**Key words:** High-elastic and crisp

**Reasons for recommendation:** The yarn has high elasticity and good recovery; the fabric spun by the yarn is clear in texture, the surface of the fabric is flat and not easy to wrinkle, and the hand feeling is soft and crisp. The finished garment is comfortable and fit, and key parts of the clothing (such as elbows, hips, and knees) are not easy to pack and deform, and it is dyed at room temperature, being natural and environmentally friendly, with good skin-friendly nature. The sustainable development has been realized.

Scope of application: Spring and summer shirts

Representing enterprises: Wuxi Simian Textile Co., Ltd.; Brand – "Qiuhe"

**Industry-university-research:** with cooperative scientific research projects with Jiangnan University and Hong Kong Polytechnic University.

### 绵柔弹性聚酯纤维纱

### Soft and Elastic PET Fiber Yarn

产品规格: 聚酯纤维(涤纶) 195dtex/288F (DTY 氨纶包覆丝)

关键词: 弹力优、柔软细腻

推荐理由: 纱线所制备的布料具有良好的弹力效果,且布面丰满、手感柔软细腻、色

泽柔和、牢度大,抗皱性好,有较强悬垂性。

适用范围:与棉纱交织的高档牛仔布、运动登山服、休闲衫、弹性花边布

代表企业: 桐昆集团浙江恒盛化纤有限公司

**产学研:** 国家企业技术中心,省级企业研究院、国家认可实验室等;与浙江理工大学建立

合作关系

**认证、标准及专利:** 通过 ISO9001、ISO14001 认证;按照标准 FZ/T12040-2013《涤纶(锦纶)/氨纶包覆丝》生产;拥有《一种传动计量控制系统降低纤度偏差的方法 - 专利》实用新型专利(申请号: 2180824039.3)

### 指标 Indicator comparison

项目 Item	实测值 Measured value
线密度偏差率 (%) Deviation rate of linear density (%)	0
线密度变异系数 CV 值 (%) CV value of linear density variation coefficient (%)	0.05
断裂强度 (cN/dtex) Breaking strength (%)	3.4
断裂强度变异系数 CV 值 (%) CV value of breaking strength variation coefficient (%)	2.78
断裂伸长率 (%) Elongation at break (%)	19.8
断裂伸长率变异系数 CV 值 (%) CV value of elongation at break variation coefficient (%)	9.25
沸水收缩率 (%) Boiling water shrinkage (%)	3.5
含油率 (%) Oil content (%)	4.52
网络度 / (个/M) Degree of network (piece/M)	130

Product specification: PET Fibers (Polyester) 195dtex/288F (DTY Covered Spandex)

Key words: Excellent elasticity, being soft and delicate

**Reasons for recommendation:** The fabric prepared by the yarn has good elastic effect, and the cloth is full, the hand feeling is soft and delicate, with soft color, strong fastness, good wrinkle resistance and strong drapability.

**Scope of application:** High-grade denim interwoven with cotton yarn, sports mountaineering suit, leisure shirt, elastic lace cloth

Representing enterprises: Tongkun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.

**Industry-university-research:** National Enterprise Technology Center, Provincial Enterprise Research Institute, National Accreditation Laboratory, etc.; establish cooperation with Zhejiang SciTech University.

**Certification, standards and patents:** Obtain ISO9001, ISO14001 Certification; it is produced in accordance with the standard FZ/T2040–213 Polyester (Nylon) / Covered Spandex, and has the utility model patent (Application No.: 218082409.3) of A Method for Reducing Denier Deviation of Transmission Metering Control System – Patent

### 202 春夏 原液着色纤维 色彩流行趋势

Spring/Summer Color Trends of Dope-dyeing Fiber

### Part 1

### 个性

### Personality

### 破界

**BOUNDARY BREAKING** 

### 沉淀

PRECIPITATION

### 无垠

BOUNDLESSNESS

个人自我追求的三个阶段,不断的打破自 我界限,以获得沉淀后的重生。

There are three stages of self-pursuit, during which the ego boundaries are constantly broken to reach rebirth after precipitation.

### Part 2

### 游吟诗人

TROUBADOUR

### 四季沐歌

BATHING IN SONGS OF FOUR SEASONS

### 几何哲学

**GEOMETRIC PHILOSOPHY** 

### 未来科技

FUTURE SCIENCE AND TECHNOLOGY

### 十色陆离

### Fantastic and Rich Colors

不同的生活态度。

多聆听,多观察,勤思考,以明是非。

Different Life Attitudes. Listen, observe and think more to distinguish between right and wrong.

### Part 3

### 阳春三月

SPRING MARCH

### 万籁俱寂

ABSOLUTE SILENCE REIGNING SUPREME

### 重逢

REUNION

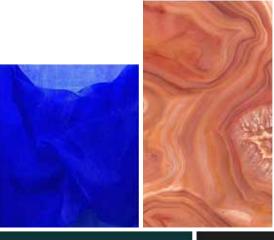
### 岁月静好

### Peaceful Life

讲述的是复苏与对未来的期盼。审视过去, 重拾对未来的期望。乌云会散去,阳光一 直在。

It's about recovery and expectations for the future. Look back to the past so as to pick up expectations for the future. Every cloud has its silver lining.

### Part 1 个性 Personality



Boundary Breaking 破界



破界,指打破自身的界限,不断的突破自己,浓郁的红色与丝绒松木绿色、高饱和的数字蓝与明黄色进行碰撞、糅合,模糊了边界, 互相入侵、浸染, 并用蜡紫色、冷暖互调的浅灰色进行调和,饱满、浓烈、层次丰富。

Boundary breaking refers to the process of breaking the ego boundaries and constantly breaking through oneself. The boundaries are obscured with the collision and blending of strong red and velvet pine green, highly saturated digital blue and bright yellow. After the mix and dyeing of these colors, the tone is reconciled with wax purple and warm-and-cool light gray, which brings the effects of richness, strong and plentiful layers.





### Precipitation **沉淀**

一点一滴的积累,滴水穿石,聚沙成山。用大量土质粽、青木灰绿、苔藓绿等 具有沙土质感的色彩营造出一种朦朦胧胧的质朴的大地气息。

Through bit-by-bit accumulation, constant dripping can wear away a stone, and a mountain can be made out of a molehill. Use a lot of colors with sandy texture (like earthy brown, green wood gray green and moss green) to create a hazy and plain earthy flavor.



Part 1 个性 Personality

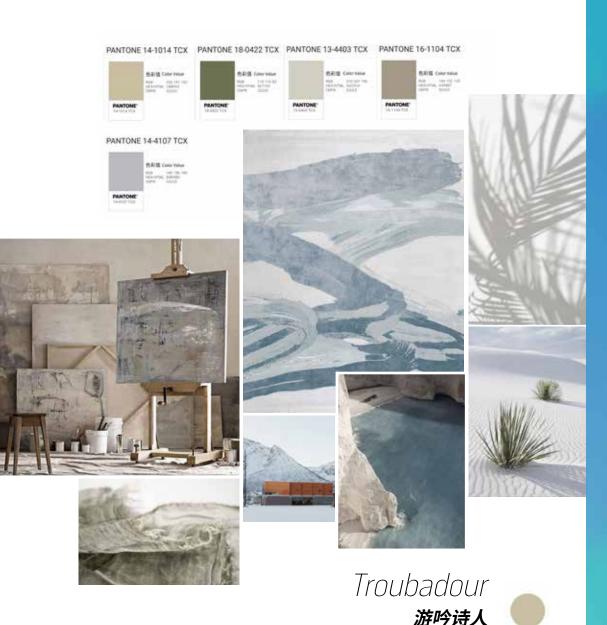
### Part 1 个性 Personality

### Boundlessness 无垠



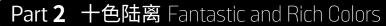
将自己的边界各个击破,达到无界。用沉静的冷灰调和 浅色的沙冰黄、肉质粉、具有颗粒感的鹅黄和浅松木 灰交相呼应。沉静、通透,泰然若是。

Break all the ego boundaries to reach boundlessness. Use the calming cold gray to blend with the light smoothie yellow, flesh pink, grainy light yellow and light pine gray to reach the effects of calmness, transparency and impassivity.

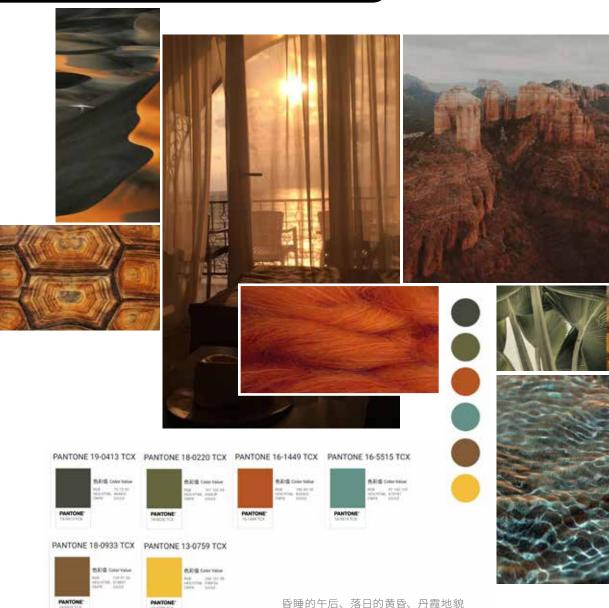


粗织亚麻制作的画布,爱琴海畔颗粒感的岩石,白色细沙中生长的苍绿色的植物,雾气氤氲,仿佛耳畔传来大洋彼岸的游吟诗人在低唱浅吟。色调整体为明度高饱和度低的浅灰蓝、浅卡其等。

The canvas made of coarse linen, grainy rocks on the banks of the Aegean Sea, pale green plants growing in white fine sand and enshrouding mist bring you to a wonderland where a troubadour is crooning across the ocean. Light gray-blue, light khaki and other colors with high brightness and low saturation serve as the overall tone.



### Part 2 十色陆离 Fantastic and Rich Colors



Bathing in Songs of Four Seasons **四季沐歌**  Imagine a lethargic afternoon, sunset of the twilight, red rocks of Danxia landform, moss and lichen under mottled sea water, and soft waxy wool fabric. The warm brown and orange are taken as the major tones and matched with warmer olive green and gray blue to create a warm, moist, calming and peaceful atmosphere.





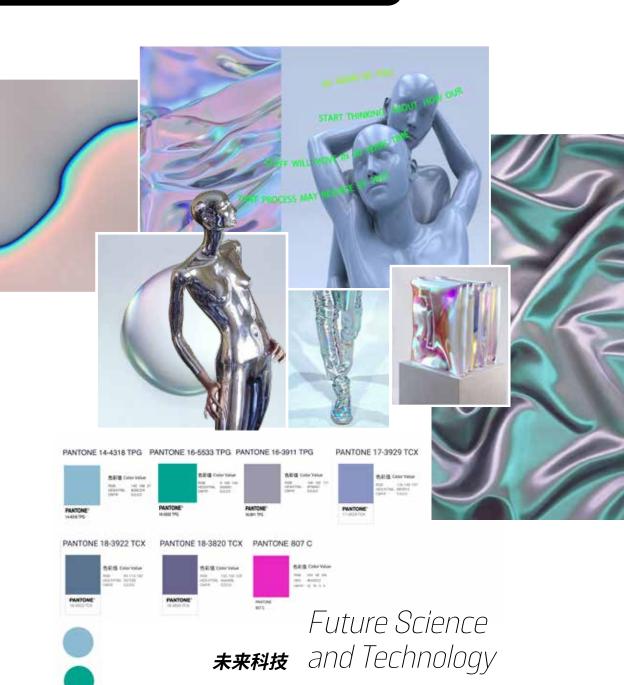
凝练的线条、简洁的几何色块、干净的几何体块。稳重安静的莫兰蒂色 调、质朴的墙灰,静静的伫立着,仿佛在沉思。是富有质感的生活哲学。

The lines are concise, the geometric color blocks are simple, and the geometry blocks are clean. The steady and peaceful Morandi tones and plain wall gray are standing quietly as if in meditation. What a textured life philosophy!



Part 2 十色陆离 Fantastic and Rich Colors

### Part 2 十色陆离 Fantastic and Rich Colors



五颜六色的水波起伏闪烁,等离子态的物质在不知名的地方游荡、漂浮、蔓延。注入代码的机器人闭上双眼开始聆听、沉思。金属质感映着光芒变换着颜色。以冷调的颜色搭配金属色,些许高饱和色点缀其间。安静中透着一丝诡异的气息。

The colorful ripples rise, fall and shimmer, and the plasma matter wanders, floats, and spreads in unknown places. The robots programmed with codes close their eyes and begin to listen and meditate. The color of the metal texture changes during light reflection. The cold colors are matched with metal luster, and some high saturation colors are embellished among these colors, bringing a little bit weird atmosphere in the silence.







雨过天晴,乌云褪去,阳光落了一地,满是欢喜。空气中溢满明丽、自在。海盐味的天空、被阳光呵护的无名小花的芳香、青草味的空气。整体的色调明亮、欢快。

The sun comes out again after a rain, dark clouds disperse and sunlight shines over the whole earth, which always brings full joy. The air is filled with beauty and freedom. And the overall tone is bright and cheerful with the sky with the flavor of sea salt, the fragrance of the little flowers that are pampered by the sun and grassy air.

### Part 3 岁月静好 Peaceful life

### Part 3 岁月静好 Peaceful life

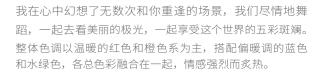


乌云黑压压一片遮住天际,只有一丝光悄无声息的拨开云端,钻了出来。整体色调灰暗、阴沉。而一丝暖橘色为压抑的氛围增添了生机与希望。

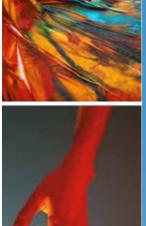
The sky is covered with dark clouds, and only a ray of light pushes aside the clouds at the top and comes out. The overall tone is gray and gloomy, but a hint of warm orange brings more vitality and hope to the depressed atmosphere.







I have imagined countless scenes of reuniting with you in my heart. We can dance as much as we like without any agony, see the beautiful aurora together, and enjoy this colorful world together. The warm red and orange-colored items are taken as the overall tone and matched with warmer blue and aqua green. The blending of all these colors brings emotions that are intense and hot.



Reunion **重逢** 



### SS 纤维素纤维 面料流行趋势 Cellulose Fiber Trends

### MUTED HUE

### 走进"环保色"的奇幻世界

Mutated Hue Walks into the Fantasy World of "Green Color"

### **SUBCULTURE**

街头经典革新演绎, 探索城市街头 style

Classic Innovation Interpretation, Exploring Urban Street Style

### INNATE

森系回归, 人与自然的平衡支点

The Returning of INNATE Mori, the Fulcrum of Balance Between Man and Nature

### FESTIVAL

<mark>复古摩登的波西米亚</mark>嬉皮风, 唤起大胆自由新精神

The Festival Retro-modern Bohemian Hippies Evokes a Bold and Free New Spirit

### TO THE MOON

重返月球, 数字化畅想未来!

To The Moon, Go Digital

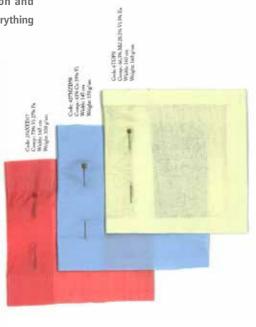
Fantasy World of "Green Color"

走进 "环保色"的奇幻世界 Mutated Hue Walks into the

色彩给我们无尽的想象,让一切事物在我 们脑海中的印象逐渐变得清晰起来。"

"Color gives us endless imagination and gradually makes the impression of everything in our mind clear."





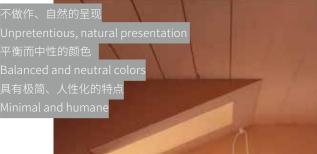


从大自然中汲取灵感,将生 活和生存环境与我们的穿衣联 系起来,亲近自然、走进自然, 并带来更细腻柔和的色彩,这 也和北欧风的自然质朴风格, 共同演绎出"环保色"的新趋势。

Drawing inspiration from nature, linking our living and living environment with our clothes, being close to nature, walking into nature, and bringing more delicate and soft colors, which also interprets the Nordic style's natural and rustic style together. "Environmentally friendly colors".



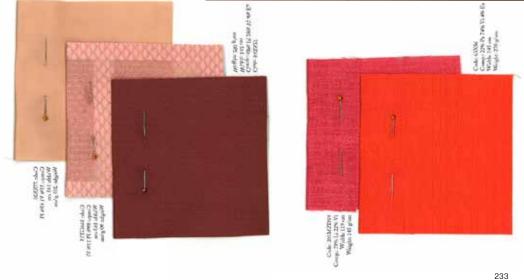
### Key words



以环保之名,运用可持续 的纱线和面料制作。 越来 越多的人追求源自天然的 材料,回归大自然,探索 前瞻性设计。

Made with sustainable yarns and fabrics in the name of environmental protection. More and more people are pursuing natural materials, returning to nature, and exploring forward-looking designs.

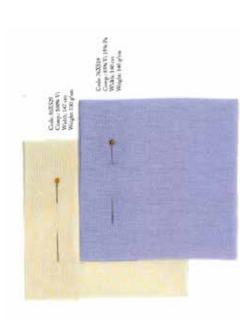




### Compositions

### 面料成分

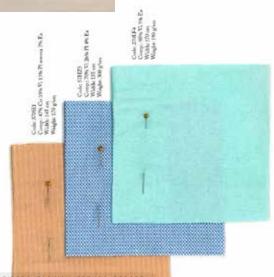
100% Viscose 100% 纤维素纤维 Viscose/Cotton 纤维素纤维 / 棉 Viscose/Polyester 纤维素纤维 / 涤纶

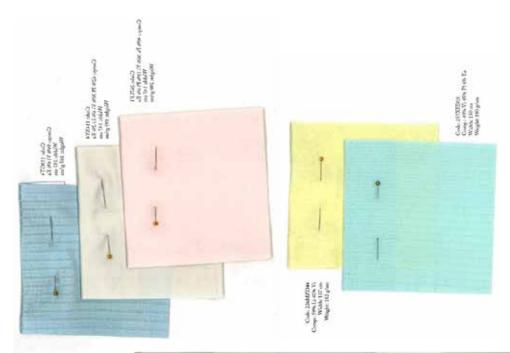


### 梭织 / 针织面料

Glenn check 格伦格子呢 Prince of wales 威尔士亲王格 Vichy 维希格 Seersucker 泡泡纱 Stripes 条纹 Checks 格子 Small prints 小印花

Fabrics/Knitwea







### Colours

颜色

Sorbets 冰霜色 Pastels 糖果色

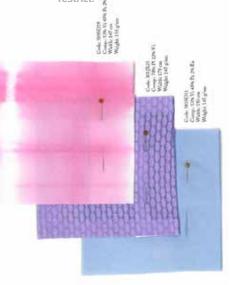
### Highlight 亮点

Sophisticated elegance 精致优雅

# Subculture Street Classic Innovation Interpretation, Exploring Urban Street Style 探索城市街头 style 探索城市街头 style

"集结潮流时尚的撞色元素,独具科技感的轻薄透气面料,令穿着更为舒适轻盈, 悬垂流畅,不受拘束大胆演绎街头经典。"

"Concentrating fashionable contrast color elements and light and breathable fabrics with a unique sense of science and technology, making wearing more comfortable and lighter with smooth draping. Bold interpretation of street classics without restrict.





Code 2010CI Comp. 62% P Wildle 198 on

现下,高级时装与街头潮流的区分界 线愈加模糊,各种青年文化、亚文化 盛行,互联网为年轻人打开展示自我 的大门,每个人都可以成为意见领袖 并诠释自己喜爱的各种风格,街头亚 文化,带来不一样的潮流复古冲击。

At present, the distinction between high fashion and street trends is becoming increasingly blurred. Various youth cultures and subcultures are prevailing. The Internet opens the door for young people to show themselves. Everyone can become an opinion leader and interpret their favorite styles. Culture brings a different retro shock.



People's needs for dressing are not limited to simple style dimensions, but they also have new requirements for materials and functions. Whether it is the functionality brought by functional design, the ultra-free experience, and the feeling of dressing brought about by materials, it perfectly builds a balanced relationship between man, city and nature.

### Compositions

### 面料成分

100% Viscose 100%纤维素纤维 Viscose/Polyester 纤维素纤维 / 涤纶 Viscose/Cotton 纤维素纤维/棉 Viscose/Nylon 纤维素纤维 / 尼龙



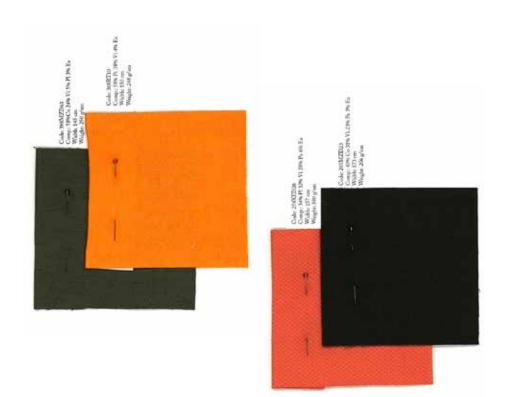


### 梭织/针织面料

Plains 平纹 Satin 缎纹 Prints 印花 Checks 格子







### Colours

Medium strong colours 中强色 Primary colours 原色

Highlight

Streetwear 街头风潮

### "在钢筋水泥的城市中,返璞归真,悄悄地把自然穿在身上。"

"Returning to our original nature in a city of steel and concrete, and putting on nature on our body quietly".

"森系生活"成为新的生活风 尚, 因崇尚自然、推崇绿色 可持续的生活方式而广受关 注。人们对于穿搭的需求,不 再仅限于款式上的靓丽,对服 装质感和面料的天然,柔软 舒适以及健康安全的需求也日 益重视。纤维素纤维比棉花 更柔软, 赋予了消费者对舒适, 无边界的极度需求。

"Mori life" has become a new lifestyle, and is widely concerned because it advocates the nature, praises highly the green and sustainable lifestyle. People's demand for dressing is no longer just limited to the beautiful style, clothing texture and natural fabrics, soft, comfort and health and safety needs are also increasingly valued. Viscose is softer than cotton, providing consumers with an extreme need for comfort and no boundaries.



### Key words

森系,回归自然 Mori, returning to nature 把自然穿在身上 Putting nature on your bod

"森系"伴随着穿衣风格的改变,自然亲肤、以人为本的理念,逐渐发展并形成特有风格。这也与环保、可持续时尚的设计思路不谋而合。服饰面料的设计会更贴合当代人的生活态度和对随性舒适的穿着喜好。舒适度、使用寿命、吸湿排汗性,抑菌性和抗皱性等实用性因素也将变得愈发重要。

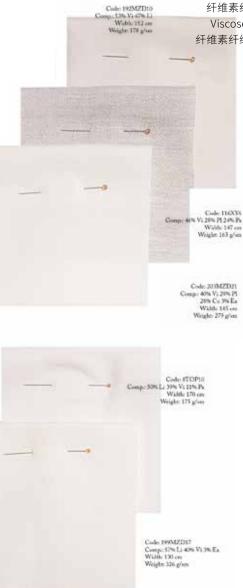
With the change of clothing style, natural skin-friendly, people-oriented concept of Mori gradually develop and form a unique style. This is also consistent with environmental protection and sustainable fashion design ideas. The design for clothing fabric will be more in line with the contemporary people's attitude to life and their dress preferences for casual and comfortable. Practical factors such as comfort level, service life, moisture absorption and perspiration, anti-bacterial and anti-wrinkle have become increasingly important too.



### Compositions

### 面料成分

100% Viscose 100% 纤维素纤维 Viscose/Linen 纤维素纤维 / 亚麻 Viscose/Cotton 纤维素纤维 / 棉 Viscose/Hemp 纤维素纤维 / 黄麻





### Fabrics/Knitwear

### 梭织/针织面料

Plain 平纹 Stripes 条形 Vichy Checks 维希格 Small floral prints 小碎印花 Tie dye prints 扎染



Code: \$46Z13 Comp.: 70.6% Pt 34,0% Vt 4,5% Ea Width: \$55.cm Weight: 290 g/sm.





Classics 经典色 Bright colours accent 明亮色 Tone on tone outfits

### Highlight

亮点

Naural 中性 Comfort 舒适 Earth 回归自然回归地球



## FESTIVAL

### 阿尼大胆自由新精神 复古摩登的波西米亚嬉皮风, 更古摩登的波西米亚嬉皮风,

这一季,自由独立的波西米亚嬉皮风强势回潮,充满六、七十年代嬉皮味道的印花面料也强势回归。然而材质的选择上,消费者对天然材质的要求超乎以往,棉、麻、纤维素纤维等材料都成为这类风格的首选。纤维等材料都成为这类风格的首选。

This season, the free and independent bohemian hippie style has returned strongly, and printed fabrics full of hippie flavors in the 1960s and 1970s have also returned strongly. However, in terms of material selection, consumers have higher requirements for natural materials than ever before. Cotton, hemp, cellulose fibers and other materials have become the first choice for this style.







Hippie 打破传统界限的用色突破 Breaking the traditional boundaries of color 夏日 party,年轻人的狂欢 Summer party, carnival of youth

纤维素纤维 viscose 正是想表 达追求自由精神的态度,凸显 个性,大胆运用天然木源纤 维,柔软舒适,以可持续的时 尚理念,运用循环可再生、可 降解的纱线和面料制作,佐以 奢华的民族风花纹和"玩出界" 的配色,完美演绎嬉皮现代主 义的个性时尚,尽显自由态度 与洒脱姿态。 Cellulose fiber viscose is precisely to express the attitude of pursuing the spirit of freedom, highlighting personality, bold use of natural wood fiber, soft and comfortable, sustainable fashion concept, using recycled renewable and degradable yarns and fabrics to make The luxurious ethnic style pattern and the color of "playing out of bounds" perfectly interpret the personality and fashion of hippie modernism, showing a free attitude and a free and easy attitude.

### Compositions

### 面料成分











### 梭织 / 针织面料

Tartans 苏格兰格呢 Stripes 条形 Checks 格子 Colourful prints 多彩的印花 Denim 牛仔 Wax print 蜡染 Batik prints 巴蒂克印花布 Patchwork 拼贴布



Comp. 77% V; 27% Co. 3% Ex. Wafer 105 cm. Wager 225 g/ee.

Code 99XXZ Comp.: 80% V/ 20% Pa Width: 140 cm Wight: 105 g/sm

### Colours

颜色

Bright colours 明亮色 Tone on tone outfits 同色系延展

### Highlight





Code: 223MZ2039 Comp. 65% Ca 20% Vt 3% Jt 3% Ea Walte 145 ca Weight 311 gives

"人类前进需要两个「轮子」——艺术和科技,艺术创造梦想,科技推动进步。"

"Color gives us endless imagination and gradually makes the impression of everything in our mind clear."

今日,由月球、太空、宇航为主题或延伸的极简主义设计风格应运而生,它被称为"未来主义",以此满足人们对未来时空的好奇心。随着我们的世界越来越数字化,合成质感色彩将愈发流行,更呼应了数码时代的需求。

Today, the minimalist design style with the theme or extension of the moon, space, and space aviation emerges at the right moment, which is called "futurism", aiming to satisfy people's curiosity about the future space and time. As our world becomes more digital, synthetic texture color will become more popular and more responsive to the needs of the digital era.





### Key words

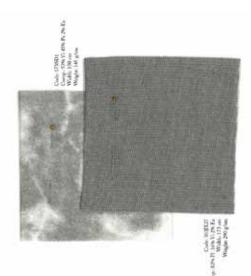


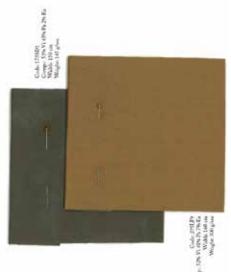
自然 现实 未来 Nature Reality Future 月球 虚拟 太空 Moon Virtual Space

Digitization Synthesis Artificial intelligence

通过回收面料,再生纤维打造环保新面料,加速推动服装产业环保化的重要进程,顺应可持续时尚趋势。服装的设计也将过去和现在、光线与暗影、自然与科技进行结合,创造出一个「可持续」的未来愿景。以环保为初心,运用可循环可降解原料制作。设计不限当下,更放眼未来。

Recycled fiber creates new environmental protection fabrics through recycling fabric, accelerates the important process of environmental protection of clothing industry, adapting to the trend of sustainable fashion. The garment design also combines past and present, light and shadow, nature and technology to create a "sustainable" future vision. With environmental protection as the original aspiration, it adopts recyclable and degradable raw material. Design should not be limited to the present, but also to the future.









### Compositions

### 面料成分

100% Viscose 100% 纤维素纤维 Viscose/Polyester 纤维素纤维 / 涤纶 Viscose/Nylon 纤维素纤维 / 尼龙 Viscose/Cordura 纤维素纤维 /Cordura

### cs/Knitwear

### 梭织 / 针织面料







### **Colours**

### 颜色

Neutrals 中性色 Red 红色 Yellow 黄色 Fucshia 紫红 Blue 蓝色

# Highlight

#### 亮点

Moon 月球 Performance 功能性 Shiny 闪亮





#### 总结语:

可持续性发展成为主流,再生风格增加质感强化个性。追求精致的平凡,简洁流畅的线条使整体造型更简单纯粹。通过技术突破使得纤维素纤维回收面料成为可能,从绿色出发回归绿色,循环使用,将舒适美化不断传递。

含有 viscose 的面料有着很好的色泽表达力, 以及富有质感的张力,诠释了几何、线条、色块, 创造出具有灵活生命力的服装。

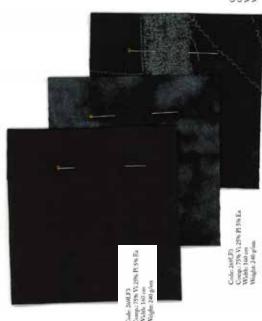
取材于自然,人性化设计,纤维素纤维极度柔 软的质感,流畅的线条赋予了设计师可自由表 达的空间。

## Code 1738D1 Compa 57% Yi 45% IS 26 Walter 150 on Weight 145 g/mi

#### Concluding remarks:

Sustainable development has become mainstream, and the regenerative style adds texture and strengthens personality. The pursuit of exquisite and ordinary, simple and smooth lines make the overall shape simpler and purer. Through technological breakthroughs, it is possible to recycle cellulosic fiber fabrics, return to green from the green, recycle and use, and pass comfort and landscaping.

Viscose-containing fabrics have good color expression and rich texture tension, interpreting geometry, lines, and color blocks to create clothing with flexible vitality. Based on natural and humanized design, the extremely soft texture of cellulose fibers and smooth lines give designers free space to express.



# Downstream Forecast 下游趋势预测

# 冬季户外运动纺织品 的应用需求

Application Requirements for Winter Outdoor Sports Textiles

# 牛仔产业技术 创新发展趋势

Technological Innovation Development Trend of Denim Industry

# 智能纺织品的 研究进展及未来展望

Research Progress and Future Prospects of Intelligent Textiles

# 可穿戴压力传感织物

Wearable Pressure Sensing Fabric



# 冬季户外运动纺织品的应用需求

北京服装学院 Beijing Institute of Fashion Technology 张天骄,刘莉 Zhang Tianjiao, Liu Li

2022 年冬季奥运会即将在北京 - 张家口举行,带动了越来越多的人投身到冰雪运动中来,从专业体育运动到大众体育运动,再到休闲旅游活动,形成了不同层次的对冬季户外运动纺织品的应用需求。细致分析并掌握这些需求有助于我们纺织行业主动出击,使纺织纤维领域的先进技术得到准确应用。

从市场表现看,对冬季户外运动纺织品的初级需求是轻质、保暖。

开展冬季运动的地区普遍气候寒冷,户外天气变化多样。由轻质又保暖的材料制成的运动服装,不仅能有效防止冻伤,还能做到轻便、美观。目前得到广泛应用的保暖材料品类多样,有棉、毛、羽绒等天然材料,也有经过改性的各种化学纤维材料,如中空纤维、超细纤维絮片等。其中,羽绒的保暖效果最为突出,蓬松的绒朵可以保持大量的静止空气,起到很好的隔热效果,既轻又暖;但羽绒又极易吸湿,吸湿后的羽绒保暖率几乎折半<sup>[1]</sup>,所以户外防寒服装较少使用羽绒来制作。中空纤维絮片和超细纤维絮片也能在纤维内和纤维间保有大量静止空气,保暖效果十分理想,且不受潮湿环境的影响,目前市场应用较多。但这类合成纤维材料长时间使用易变形,从而影响保暖效果。

The 2022 Winter Olympics will be held in Beijing-Zhangjiakou, which will bring more and more people into the snow sports. Among professional sports, mass sports and leisure tourist activities, it shows different levels of application requirements for winter outdoor sports textiles. A detailed analysis of these needs will help our textile industry to have the initiative in mket, and apply advanced technology in the field of textile fibers accurately.

From the perspective of market performance, the primary demand for winter outdoor sports textiles is lightweight and warmth.

The area where winter sports are conducted is generally cold, and the outdoor weather varies. Sports clothing made of lightweight and warm materials can not only effectively prevent frostbite, but also can be lightweight and beautiful. At present, there are various types of thermal insulation materials that are widely used, including natural materials, such as cotton, wool, and down feather, and various modified chemical fiber materials, such as hollow fibers and ultra-fine fiber flakes. Among them, the warmth effect of down feather is the most prominent. The fluffy down feather can maintain a large amount of still air and has a good thermal insulation effect, which is both light and warm; but the down feather is extremely easy to absorb moisture, and the heat retention rate of the down feather after absorbing moisture is almost half[1], so the outdoor cold-proof clothing is seldom made with down feather. Hollow fiber flakes and ultra-fine fiber flakes can also maintain a large amount of still air in and between the fibers. The thermal insulation effect is very ideal, and it is not affected by humid environments. At present, these flakes are used in the market widely. However, this kind of synthetic fiber materials are easily deformed after a long-term use, which decreases the thermal insulation also.





图 1 宇航服气凝胶隔热内里 Fig.1 Spacesuit aerogel insulation lining

图 2 带电加热功能的美国平昌冬奥会开幕式队服 Fig.2 Uniform with electric heating function in Pyeongchang Winter Olympics opening ceremony

进入 21 世纪以来,为了得到更优异的保暖材料,研究人员利用远红外技术、气 凝胶技术以及主动加热技术为保暖材料带来了多种创新性的发展思路。例如将 ZrO2、SiO2 等陶瓷粉末或石墨烯加入纤维中,可以获得远红外线辐射功能。该类纤维絮片通 过与人体的相互作用,可以产生更好的保暖效果。气凝胶纤维拥有极高的气固比,被 称为超级保温材料。中科院苏州纳米所已经制成了芳纶气凝胶纤维,据说其保温能力是棉纤维的 2.8 倍 [2],如果该类材料的其他基本服用性能如力学性能等表现均衡,必 将成为下一步保暖材料发展的主要方向。主动加热技术与以上各类保暖手段截然不同,它是通过外界能量的输入使服装材料维持在一个舒适温度范围,也可称之为积极保暖。已得到应用的主要有化学能保暖和电加热保暖两种。化学能加热服装的反应原理是利用快速氧化反应,将化学能转变为热能。例如在纤维中加入铁粉或电气石等材料。其缺点是难以精确控制能量的释放,易发生烫伤。电加热保暖服装通常以移动电源为能源来源,配合测温元件和控温元件使用,功率可调、温度可控、续航持久。近年来,电加热服的发热材料研究已趋成熟,市场反响热烈,国内外需求量快速增加。平昌冬奥会上,美国国家队的统一装备中就应用了电加热技术。

另外,户外运动服装的保暖还应从防风面料的角度予以加强。最终,将多种保暖 技术叠加,制成具有多层结构的服装材料,将是解决冬季户外运动服装轻质、保暖需 求的有效方案。

对于大众冰雪运动来说,除了轻质保暖外,户外纺织品还应具有吸湿排汗、防水透气、耐磨等功能。

In the 21st century, in order to obtain better insulation materials, farinfrared technology, aerogel technology, and active heating technology have been used to bring a variety of innovative development ideas for insulation materials. For example, adding ceramic powder such as ZrO<sub>2</sub>, SiO<sub>2</sub> or graphene into the fiber can obtain far-infrared radiation function. This type of fiber flakes can produce better warming effects through interaction with the human body. The gas-solid ratio of aerogel fibers is very high, so it is called super insulation materials. It is claimed that the aramid aerogel fiber made by The Suzhou Institute of Nanotechnology, Chinese Academy of Sciences has 2.8 times thermal insulation capacity of cotton fiber [2]. If other basic wearability properties of this material, such as mechanical properties, are balanced, it will be the main direction of the development of thermal insulation materials in future. Active heating technology is completely different from the above-mentioned various types of warming methods. It is to maintain the clothing material in a comfortable temperature range through the input of external energy, which can also be called active warming. There have been two main applications: chemical energy heating and electric heating. The reaction principle of chemical energy clothing heating is to use a rapid oxidation reaction to convert chemical energy into thermal energy. For example, materials such as iron powder or tourmaline are added into the fiber. The disadvantage is that it is difficult to precisely control the release of energy and prone to burns. Electric heating clothing usually uses mobile power as the source of energy. It can be used in conjunction with temperature measurement components and temperature control components to adjust power, control temperature, and keep endurance. In recent years, the research on heating materials for electric heating clothing has become mature, the market response has been overwhelming, and the demand at home and abroad has increased rapidly. At the Pyeongchang Winter Olympics, electric heating technology was applied in the uniform equipment of the US national team.

In addition, the warmth of outdoor sports clothing should be strengthened from the perspective of windproof fabrics. In the end, a variety of thermal insulation technologies are stacked to make a clothing material with a multi-layer structure, which will be an effective solution to the demand for lightweight and thermal insulation of winter outdoor sports clothing.

冬季户外运动强度高,发热量高、出汗量 大, 因此对服装内层的吸湿排汗功能以及外层 的防水透湿功能要求非常高。具有吸湿排汗功 能的面料通常是涤纶或锦纶的异型纤维或超细 纤维。例如 Coolmax 纤维就是因具有四沟槽 结构而具有良好的导湿性,且因为面料本身不 亲水而能够保持持久干爽。防水透湿织物主要 是具有大量微孔的层压织物和涂层织物,目前 市场上被推崇的 Gore-Tex 面料即是一种带微孔 的 PTFE 薄膜与传统纺织面料的层压织物,其 微孔多而小,从而达到抵御雨雪并有效排除汗 液湿气的效果,同时具有防风性和透气性。但 是层压织物与涂层织物的手感和悬垂性往往不 是很好,有可能影响运动时的舒适性 [3]。冰雪 场地湿滑, 服装面料经常发生剧烈摩擦, 普通 面料难以承受,需要在易发生摩擦的部位拼接 耐磨锦纶面料,或者其他具有较高耐磨性的高 性能纤维材料。

专业体育运动追求更高、更快、更强,户外冰雪运动以速度和技巧见长,对服装有特殊的减阻要求。运动员在高速运动时,消耗的能量中有80%用于克服空气阻力。想要消除空气阻力,除了运动员应掌握适合的姿态外,紧身的服装、拥有特殊表面结构的面料也能起到不小的作用。据测试,织物表面规律排列的微小"齿状物"可使运动员周围的空气更平稳地流过,从而获得更快的速度<sup>[4]</sup>。日本和美国都已开发出具有减阻功能的特殊面料,我国的相应研究也在国家体育总局冬运中心的支持下顺利展开,有望在2022年冬奥会上助力我国健儿夺金。

专业级的冰雪运动由于速度快、技巧要求高,运动员的损伤风险极高。在 2018 年平昌冬奥会期间,2914 名运动员在 17 天会期中共发生了 376 人次的受伤事件,受伤率达到 12.6%,其中受伤事故发生最多的项目均为户外雪上运动,如 U 型场地技巧(受伤率 28%)、单板滑雪障碍追逐(受伤率 26%)、越野滑雪(受伤率 25%)等 [5]。因此针对专业体育运动的纺织品还应该兼顾起防护的功能。

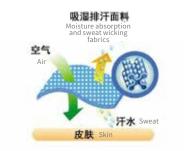


图 3 吸湿排汗面料示意图 Fig.3 Schematic diagram of moisture absorption and sweat wicking fabrics

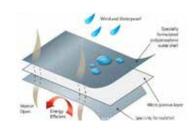


图 4 防水透湿面料示意图 Fig.4 Schematic diagram of waterproof and moisture permeability fabrics

As snow sports for the mass, in addition to lightweight and warmth, outdoor textiles should also have functions such as moisture absorption and sweat wicking, waterproof and breathability, and wear resistance.

Outdoor sports in winter have high intensity, high heat generation, and high sweat. Therefore, the moisture absorption and sweat wicking functions of the inner layer of clothing and the waterproof and moisture permeability functions of the outer layer are very demanding. Fabrics with moistureabsorption and sweatwicking functions are usually profiled or ultra-fine fibers of polyester or nylon. For example, Coolmax fiber has good moisture conductivity due to its four-groove structure, and because the fabric itself is not hydrophilic, it can maintain long-term dryness. Waterproof and moisture permeable fabrics are mainly laminated fabrics and coated fabrics with a large number of micropores. Gore-Tex fabrics currently on the market are a type of laminated fabric with microporous PTFE film and traditional textile fabrics. The pores are in large number and in small size, so it can resist rain and snow and effectively remove sweat and moisture, and can be windproof and breathable at the same time. However, the feel and drapability of laminated and coated fabrics are often not very good, which may reduce the comfort during exercise [3]. The snow and ice field are slippery, and the clothing fabric often suffers from severe friction, which is difficult for ordinary fabrics to bear. It is necessary to splice abrasion-resistant nylon fabrics or other highperformance fiber materials with high abrasion resistance in the parts where friction is more likely to occur.

Professional sports pursue higher, faster, and stronger. Outdoor snow sports are known for their speed and skill, and they have special requirements for drag reduction on clothing. At high speed movements, athletes consume 80% of their energy to overcome air resistance. To eliminate air resistance, in addition to mastering the appropriate posture, tight clothing, fabrics with special surface structure can also play a significant role. According to tests, the tiny "tooths" regularly arranged on the surface of the fabric can make the air around the athlete flow more smoothly, thereby achieving faster speed [4]. Both Japan and the United States have developed special fabrics with drag reduction functions. Corresponding research in China has also been successfully carried out with the support of the Winter Sports Center of the State General Administration of Sports. It is expected to help Chinese athletes win gold medals at the 2022 Winter Olympics.

Professional-level snow sports are extremely risky due to their fast speed and high skill requirements. During the 2018 Pyeongchang Winter Olympics, 2,914 athletes suffered 376 injuries during the 17-day event, with an injury rate of 12.6%. The most injured events are outdoor snow sports, such as ski halfpipe (injury rate of 28%), snowboard cross (injury rate of 26%), ski cross (injury rate of 25%), etc. [5]. Therefore, textiles for professional sports should also take into account of the protection function.

目前的运动防护服装主要有三类。其一是 采用力学性能优异的纱线可直接提高服装的 抗冲击能力,这是制备软质防护服装的基本方 法。其二是利用安全气囊原理制成具有缓冲作 用的气囊或水囊类防护服装。而综合性能较 为优异的是将缓冲类材料与运动类服装材料 相结合,以复合材料制成的防护服装。早期的 缓冲材料多采用硬质海绵,但目前已有更多设 计精巧、兼顾柔软和刚强的材料可选择。例 如 HexPad 防撞独立六边形衬垫,它即可贴 合人体曲线,又可均匀分散外力,适合于重点 部位的防护设计。第三种是将剪切增稠材料用 于运动防护服装。智能材料 D30 就是最成功 的例子之一,该材料具有剪切增稠特性,未受 外界挤压时,表现出柔软、易变形的特点;当 受到外界挤压发生剧烈变形时,该材料化柔为 刚,表现出极好的抗冲击能力[6]。我国在该 领域的研究也已取得突破性的进展, 有望尽快 从军事国防领域的应用扩展到运动防护、医疗 复健等商业领域中来, 开发出具有优越防护效 果的服装复合材料[7]。

伴随着当前社会经济的高速发展和高新技 术的广泛应用,积极参与冬季户外运动已经成 为人们追求健康生活方式的一种表达。而冬季 户外运动服装则承载着我们纺织服装行业推动 全民健身和体育强国的真诚信念, 值得纺织材 料领域的研究者、生产者为之付出全部的智慧 和经验。



图 5 HexPad 独立六角形防护衬垫图 Fig.5 HexPad independent hexagonal protective pad



6运用了 D30 材料的运动防护服 Fig.6 Sports protective clothing with D30 material

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At present, there are three main types of sports protective clothing. One is that the use of yarns with excellent mechanical properties can directly improve the impact resistance of the clothing, which is the basic method for preparing soft protective clothing. The second is to use airbag principle to make airbag or waterbag protective clothing with buffering effect. The excellent comprehensive performance is the protective clothing made of composite materials by combining cushioning materials and sports clothing materials. Early cushioning materials were mostly made of hard sponges, but now there are more materials with delicate designs that take into account of both softness and strength. For example, HexPad anti-collision independent hexagonal pad can fit the curve of the human body and can evenly disperse external forces, which is suitable for the protection design of key parts. The third is to use the shear thickening material to make the sports protective clothing. The smart material, D30, has also been successfully used in this field. This material exhibits softness and easy deformation without extrusion. When the material is severely deformed with extrusion, the material becomes soft and rigid, showing excellent impact resistance[6]. Domestic research in this field has also made breakthrough progress. It is expected to expand the application from military defense to commercial areas such as sports protection and medical rehabilitation as soon as possible to develop composite materials for clothing with superior protective effects [7].

With the current rapid development in society and the widespread application of advanced technology, active participation in winter outdoor sports has become a healthy lifestyle to fashion people. The outdoor sportswear in winter carries the sincere belief of our textile and apparel industry, to promote national fitness and sports power, and it is worthy of all the wisdom and experience of researchers and producers in the field of textile materials.

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牛仔产业技术创新发展趋势

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经过数十年的快速发展,我国牛仔产业取得了辉煌的成就,奠定了在国际市场的重要地位。传统牛仔服装中高端产品出口主要集中于美欧日韩市场,这些市场对牛仔服装的环保性、功能性和时尚性要求逐步提高,对加工企业社会责任建设的要求也日趋严格,传统的牛仔服饰显然已不能满足人们的穿着需求,因此开发时尚化、功能化、高端化牛仔纺织品成为必然趋势,满足可持续发展成为当代纺织产业领域的主题,符合循环经济成为未来发展的主流。

After decades of rapid development, the China's denim industry has achieved glorious achievements, and won an important place in the international market. The export of middle-end and high-end products of traditional denim garments mainly focuses on the markets of America, Europe, Japan and Korea. However, these markets have gradually raised the requirements for environmental protection, functionality and fashion of the denim garments, and have increasinglystrict requirements for the construction of social responsibility of processing enterprises. Obviously, the traditional denim garments cannot meet people's wearing demands, and the development of fashion-oriented, functional and high-end denim textiles has become an inevitable trend. To meet the sustainable development has become the theme of the modern textile industry, and conforms to recycling economy, being the mainstream of the future development.

### Advantages of 'Chinese denim' in large quantity

Denim cloth and denim garments have always been popular with a vast number of consumers at home and abroad, and as the symbol of a free life style, denim is daily wear of American consumers. According to a survey, the American consumers have 7 jeans per capita, and jeans can be found in wardrobes of 96% of the American consumers. China is the most important source for the import of American denim garments. According to statistics of United States Customs, in 2019, jeans imports of America amounted to 5 billion dollars, and the import quantity reached 51.84 million, wherein the jeans from China accounted for 32.28% and 37.23% of the two indicators separately. The average unit price of the Chinese jeans is lower than that of products of Mexico, Vietnam, Egypt and other major source countries, and is also lower than that of American global import jeans. This shows that the China's export of denim garments to America has relative advantages in terms of the price and quantity.





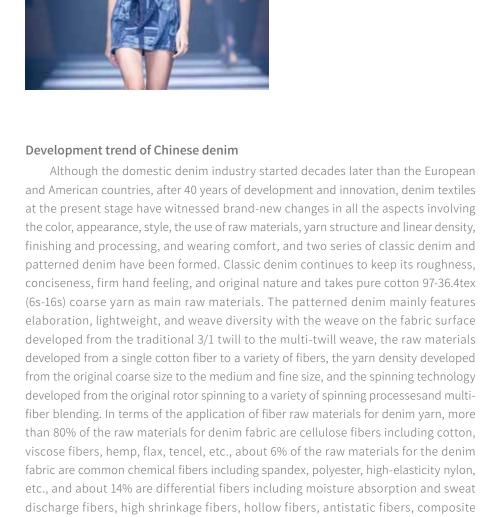


#### 体量下的"中国牛仔"优势

牛仔布与牛仔服装一直以来都是深受国内外广大消费者喜爱的产品,牛仔作为自由生活方式的标志是美国消费者的一种日常衣着。据调查,美国消费者人均拥有7条牛仔裤,96%的美国消费者的衣柜中都能找到牛仔裤的身影。中国是美国牛仔服装进口最重要的来源地。根据美国海关统计,2019年,美国牛仔裤进口额为50亿美元,进口数量5184万打,其中来自中国的牛仔裤在这两个指标中分别占32.28%和37.23%。其平均单价低于来自墨西哥、越南、埃及等其他主要来源国的产品,也略低于美国全球进口牛仔裤的平均单价。由此可见,在价格和数量上,中国的牛仔服装对美国的出口具有相对优势。

#### 中国牛仔的发展趋势

我国虽然在牛仔起步上较欧美国家晚了几十年,但是历经四十年来的发展与 创新,现阶段的牛仔纺织品无论从颜色、外观、风格,还是从原料使用、纱线结 构及线密度、后整理加工、服用舒适性等方面都发生了全新的变化,形成了经典 牛仔与花色牛仔两大系列。经典牛仔继续保留其粗犷简洁、手感厚实、返璞归真 的风格,使用原料以纯棉 97~36.4tex (6S~16S) 粗支纱为主。花色牛仔则以精细 轻质、组织多样为主要风格,织物表面的织纹也由传统的 3/1 斜纹向多纹织发 展,使用原料也从单一的棉纤维向多种纤维原料发展,纱线的密度也由原来的粗 特号向中、细特号发展,纺纱工艺也由原来的转杯纺纱向多种纺纱工艺与多纤混 纺技术发展。在牛仔布用纱的纤维原料应用情况中:牛仔面料原料用量80%以 上为纤维素纤维(棉、粘胶纤维、大麻、亚麻、天丝等),牛仔面料原料用量6% 左右为普通化学纤维(氨纶、涤纶、高弹锦纶等), 牛仔面料原料用量 14% 左右 为差别化纤维(吸湿排汗纤维、高收缩纤维、中空纤维、抗静电纤维、复合纤维 等)。由于各种牛仔纺织品的开发与创新都需要以牛仔纱线的创新为依托,因此牛 仔纱的技术创新与质量提升是开发新颖牛仔纺织品的重要前提, 现阶段我国牛仔 纺织品用纱的创新技术主要有: 弹力包芯纱技术创新、竹节纱的技术创新、彩点纱、 麻灰纱、多纤组合牛仔纱等。



fibers, etc. Since the development and innovation of various kinds of denim textiles need to rely on the innovation of denim yarn, the technological innovation and quality improvement of denim yarn become an important prerequisite for the development of new denim textiles. At present, the innovative technologies of denim yarn for the denim textiles in China mainly involve the technological innovation of elastic core spun yarn, and the technological innovation of slub yarn, colorful dot yarn, inen yarn, multi-fiber

combination denim yarn and the like.

DOWNSTREAMFORECA



#### 中国牛仔行业的提质转型

在我国市场上,约 90% 的牛仔布用于牛仔服装 的生产, 其中 42.7% 用于牛仔裤的生产, 29% 用来 制作牛仔茄克衫,10.5% 用来制作儿童牛仔服,还 有 7.8% 用于制作牛仔裙。目前, 我国牛仔服装的加 工生产已经形成完整的现代产业链, 牛仔服装的研发、 设计、营销能力正在快速提升,企业逐步将设计与营 销中心集中到上海、广州、深圳、香港等时尚聚集地, 甚至在美国和欧洲等国际市场的时尚之都设立研发中 心,以促进国内牛仔产业的升级和结构调整。根据对 中国牛仔产业进行的 SWOT 分析,现阶段该产业发展 趋势已进入深度调整周期。牛仔服装生产企业急需 转型升级,调整产品结构,减少低端、低附加值产品, 增加高端、高附加值产品。因此牛仔纺织业的进一步 发展必须依靠原料的开发,流行色的应用,机械设备 的改进,设计工艺技术的创新,特别是后整理工艺的 提高,服装款式的更新和服用领域的开拓等诸多方面 的配合, 使之不断提高, 进一步突出面料的个性, 赋 予新意,领先一步,使牛仔纺织业的开发创新工作不 断有所进展,实现牛仔低耗水量、低能耗、低排放的 绿色环保的理念。

# Quality improvement and transformation of China's denim industry

In China's market, about 90% of denim is used in the production of denim garments, of which 42.7% is used in the production of jeans, 29% is used in the production of jeans jackets, 10.5% is used in the production of children's jeans wear, and 7.8% is used in the production of jeans skirts. At present, a complete modern industrial chain has been formed for processing and production of denim garments in China with rapid enhancement of capabilities of research and development, design and marketing on the denim garments. Enterprises gradually centralize their design and marketing centers on fashion metropolises such as Shanghai, Guangzhou, Shenzhen and Hong Kong, and even set up research and development centers in fashion capitals of the United States, Europe and other international markets, so that the upgrading and structural adjustment of the domestic denim industry are promoted. According to the SWOT analysis on the China's denim industry, the development trend of the industry has entered a deep adjustment cycle at the current stage. The transformation and upgrading of the denim garment production enterprises are urgent so as to adjust the product structure, reduce the low-end and low value-added products, and increase high-end and high value-added products. The further development of the denim textile industry must rely on cooperation of various aspects including the development of raw materials, application of fashion colors, improvement in mechanical equipment, innovation on the design process technologies, particularly the improvement of the afterfinishing process, updating of clothing styles, exploration of the wearing field and the like. In this way, the denim textile industry can be constantly improved, the personal features of fabric are furthermore highlighted, the fabric is endowed with novelty in ahead, the development and innovation work of the denim textile industry makes process constantly, and an environmental protection idea of low water consumption, low energy consumption and low emission of the denim is accorded with.





#### 我国牛仔行业的可持续创新

为了推动我国牛仔纺织行业的绿色可持续化进程,也需开发一些生物质或可循环再生原料制备绿色纤维的新技术,使其生产过程低碳环保,制成品丢弃后对环境无污染或可循环再利用,目前主要包括生物基化学纤维、循环再利用化学纤维、原液着色化学纤维。为了推动牛仔纺织行业的生态文明建设,智慧靛蓝 Smart Indigo 技术作为全球领先的电解还原技术,在一定程度实现了清洁生产,利用三维电解反应器,只需要靛蓝染料、水、烧碱和电力就能生产出液体靛蓝,排出的只有氧气。对比其他靛蓝还原技术,Smart Indigo 智慧靛蓝技术高效、环保、体积小、成本低、产品含量纯粹稳定,完全不含化学品助剂及金属离子。

针对牛仔染色工艺:一、牛仔浆染纱工艺创新,可通过优选"复合还原剂"来取代传统浆染纱生产中的保险粉和硫化碱,改进牛仔染色配方、生产工艺等技术应用达到精准配料,直接减少含硫化合物的产生及染色过程中产生的废气和废水污染总量,从源头上实现牛仔面料染色的清洁生产。可使靛蓝染料的耗用减少 20% 以上、硫化染料的耗用减少 10% 以上、烧碱耗用量降低 25%。二、染色装备自动化创新,通过图像识别、红外光谱、分光光度计等设备的检测,进行染色过程中色彩控制。三、染色工艺创新,如电化学染色、泡沫染色等新型染色技术的研究应用。四、通过纱线染色或棉花染色后再进行成衣制造以减少过多的环境污染。

### Sustainable innovation of China's denim industry

In order to push forward the green sustainable process of China's denim textile industry, it is also necessary to develop some new technologies for the preparation of green fibers from biomass or recyclable raw materials, so that the production process is low-carbon and environmentally friendly, and the finished products are discarded without causing environmental pollution or recyclable. At present, the green fibers mainly include biology-based chemical fibers, recyclable chemical fibers, and original liquid colored chemical fibers. In order to promote the construction of ecological civilization in the denim textile industry, Smart Indigo technology, the global leading electrolytic reduction technology, has achieved clean production to a certain extent. By using a three-dimensional electrolytic reactor, liquid indigo can be produced simply with indigo dye, water, caustic soda and electricity, and only oxygen is discharged. Compared with other indigo reduction technologies, Smart Indigo technology is efficient, environmentally friendly, small in volume, low in cost, pure and stable in product content, and completely free of chemical additives or metal ions.

The denim dyeing process involves the four aspects of 1, innovation in the denim pulp yarn dyeing process, wherein composite reducing agents can be preferably selected to replace sodium hydrosulfite and alkali sulfide in the traditional pulp yarn dying production, the denim dyeing formula, production process and other technology applications are improved to achieve accurate proportioning, the production of sulfur-containing compounds and the total amount of waste gas and waste water produced in the dyeing process are directly reduced, clean production of denim fabric dyeing is achieved fundamentally, and in this way, the consumption of indigo dye can be reduced by more than 20%, the consumption of sulfide dye can be reduced by more than 10%, and the consumption of caustic soda can be reduced by 25%; 2, automatic innovation in dyeing equipment, wherein through the detection of image recognition equipment, infrared spectrum equipment, spectrophotometers and other equipment, color control in the dyeing process is achieved; 3, innovation in the dyeing process, wherein research and application of electrochemical dyeing, foam dyeing and other novel dyeing technologies are involved; 4, finished garment manufacturing after yarn dyeing or cotton dyeing, wherein in this way, excessive environmental pollution is lowered.





环境友好的牛仔洗水技术是牛仔服装制造过程中的一个重要环节,也是牛仔服装核心附加值的体现。由于传统牛仔服装常以石磨、喷沙、漂洗、酸洗、怀旧洗和酶洗等作为"洗旧感"风格整理的主要手段,因此该生产过程具有高污染、高耗能、高劳动密集、低附加值的"三高一低"的特点。可以从智能化装备、创新型工艺两个方面入手,实现牛仔服装水洗加工的环境友好。一是研发牛仔服装洗水智能化装备:洗水生产关键工艺的自动化及节水化装备、烘干过程能源综合利用体系及智能化装备、智能化牛仔服装洗水生产管理系统;二是推广牛仔服装水洗工艺中激光技术、臭氧技术、生物酶技术、数码印花技术等的应用。达到生产全程少水,关键步骤无水,少水部分也可重复利用的纺织行业的"无水制造"技术。

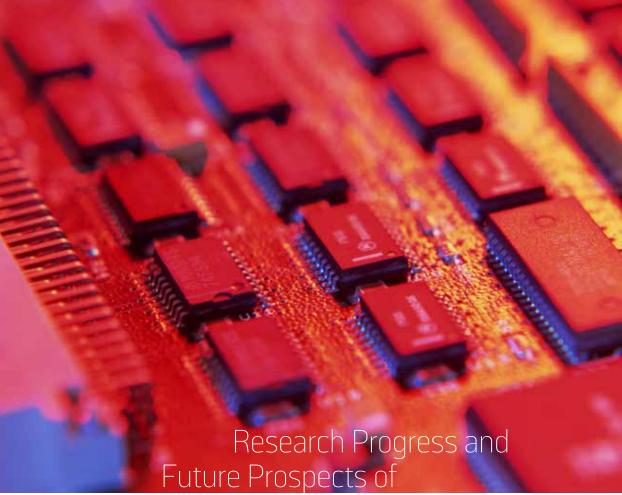
#### 行业的机遇与挑战

2020年以美国为主的欧美国家将依然是全球最大的纺织服装零售市场。中国作为美国服装市场的最大来源国,相关企业也必将受益。结合年初出现的新冠病毒肺炎疫情给各地工厂企业及科研团队带来的重重困难及欧美市场损失,更需加强新设备和新技术的应用,减少碳排放量、降低水耗和能耗、提高能源利用率、减少人工成本、提升生产效率、提高牛仔产品品质的公认性。

The environment-friendly denim washing technology is an important link in the denim garment manufacturing process, and also the embodiment of the core added value of denim garments. As the traditional denim garments usually adopt stone grinding, sand blasting, rinsing, acid pickling, nostalgic washing, enzyme washing and the like as major means for 'oldwashed color sense' style finishing, the production process has the features of 'three highs and one low', which means high pollution, high energy consumption, high labor density and low added value. We can start from two aspects of intelligent equipment and innovative process to realize the environmental friendliness of denim garment washing. Firstly, the intelligent equipment for denim garment washing needs to be researched and developed including automatic and water-saving equipment for key processes of washing production, comprehensive energy utilization systems and intelligent equipment for the drying process, and intelligent production management systems for denim garment washing. Secondly, the application of the laser technology, ozone technology, bio-enzyme technology and digital printing technology in the denim garment washing process needs to be popularized. In this way, the water-free manufacturing technology which achieves the purposes that less water is produced in the whole production process, no water is produced in the key step, and the produced less part can be repeatedly used is put forward for the textile industry.

#### Opportunities and challenges of the industry

In 2020, the European and American countries dominated by America will remain the global largest textile and clothing retail market. As the largest source country of the American clothing market, China's relevant enterprises will also benefit. Faced with the difficulties brought by the outbreak of the novel coronavirus pneumonia at the beginning of the year to factories and enterprises across China and the losses of the European and American markets, it is more urgent to strengthen the application of new equipment and new technology, reduce carbon emissions, reduce water consumption and energy consumption, increase the energy utilization rate, reduce labor costs, improve production efficiency and improve the recognition of denim product quality.



Intelligent Textiles

智能纺织品的 研究进展及未来展望

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随着数字信息化时代的到来,人们亟需一种智能系统,将智能设备集成到日常环境中,为人们提供多种便捷的服务。而生活场景的多样化、复杂化还要求该系统能够个性化、嵌入式、不唐突、随时随地可用[1]。服装作为人类的第二层皮肤,能够增强人与环境之间的交流,是智能系统的理想载体。智能服装不同于可穿戴计算机,其强调服装的重要性,同时具有感知和通信的能力。虽然人们一直致力于可穿戴电子元件的微型化,但真正的智能服装是可以通过将所有的元件转化为全纺织材料来实现。人们喜欢穿纺织品,因为它们灵活、舒适、轻便、结实、耐洗[2]。因此,在纺织品中嵌入电子功能的同时,有必要保留纺织品的特点,使织物原有的服用性能不会受到影响,这类纺织品和服装的设计一直都受到国内外研究者的高度关注,并已开发出多种智能纺织品。

随着人们对智能纺织品需求的增加及纳米技术、IT 和微电子等技术的进一步发展,为智能纺织品开辟了多种研究领域。本文着重介绍了柔性多功能织物器件的重要进展,包括基于柔性织物的能量收集 & 存储器件、变色器件、可变形器件以及先进的智能交互纺织品。最后,讨论了智能纺织品的发展前景。

With the arrival of information age, people urgently need an intelligent system to integrate intelligent devices into the daily environment and provide people with a variety of convenient services. Moreover, the diversity and complexity of life scene also requires that the system can be personalized, embedded, unobtrusive, and available anytime and anywhere [1]. As the second skin of a human, clothing is an ideal carrier of the intelligent systems to enhance the communications between humans and the environment. . Intelligent clothing, different from the wearable computer, has both abilities of perception and communication without sacrificing the wear-comfort of the ordinary clothing. Although researchers have been committed to the miniaturization of wearable electronic components, the real intelligent clothing can only be realized by fabricating all components in all-fiber or fabric shapes. People like to wear textiles because they are flexible, comfortable, lightweight, stout and washable [2]. Therefore, it is necessary to embed electronic functions in our clothing without harming these characteristics of textiles, ensuring the wear-comfort of intelligent textiles to the maximum extent. This kind textiles and clothing has attracted increasing attention all over the worldand a variety of intelligent textiles have been developed as a result.

With the increasing demand for intelligent textiles and the further development of nanotechnology, IT, microelectronics and other technologies, various research fields have been opened up for intelligent textiles. This article focuses on the important development of flexible multi-functional fabric devices, including energy harvesting and storage devices, colorchanging devices, deformable devices and advanced intelligent interactive textiles. At the end of this article, the author also pays attention to a reasonable prospect of the development in this area.



图 1 "能发电的智能织物"为 a) 商用电容,b) 手机及 c) 可穿戴设备充电 [3] Fig. 1 "Intelligent fabrics that can generate electricity" are a) commercial capacitances, b) mobile phones and c) wearable devices [3]

#### 智能纺织品的重要进展

#### 能量收集及存储

对于未来的智能纺织,它们应该更加智能和独立,以实现其功能的多样性。太阳能电池、摩擦电纳米发电机、热电装置等能量采集设备的发展以及锂离子电池、超级电容器柔性储能技术的提高,解决了纺织品的能源自给问题,使可穿戴技术领域得到进一步发展。2016 年 Chen 等 <sup>[3]</sup> 通过穿梭飞行的方式,研发出能够同时收集太阳光能和机械能来产生电能的智能织物,如图 1 所示。一小块纺织品提供的电力可以在 1 分钟内为 2 mF商业电容器充电到 2 V,直接给手机充电,甚至能够以可穿戴的方式为电子表持续供电。中国科学院半导体研究所沈国震教授 <sup>[4]</sup> 所在团队研制出一种长度可达 1.2 m 的可编织线状超级电容器,其可作为可穿戴的能量储存单元并为个人电子设备提供电能,具有很好的应用前景,如图 2 所示。

#### 智能变色

颜色对自然和人类社会都非常重要。人们可以设计绚丽多彩的图案和风格,通过简单而富有想象力的色彩组合来表达自己的情感和故事。近年来,随着消费者对服饰美追求层次的提高,对服装颜色的需求也正在由实用型向新奇型转变。变色纤维材料借助现代高新技术,使纺织品的颜色或花型随光照、湿度、温度而变化,呈现出由常规的"静态"变为若隐若现的动态效果,如图3所示。变色服装最早由美国国防部研制作为士兵的"隐形衣",可以随着周围的环境而改变颜色,以模拟不同作战地形环境的背景色,如图4所示。此后,变色服装逐渐应用到其他领域,如美国Clemson大学的研究<sup>[6]</sup>将光纤与噻吩衍生物等变色染料相结合,实现了纤维颜色的自动变化。



图 2 可编织线状超级电容器作为存储单元为可穿戴设备供电 [4] Fig. 2 Braidable linear supercapacitor, as a storage unit, supplies power for wearable devices [4]

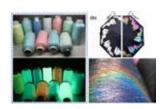


图 3 智能变色纺织品 a) 光致变色,b) 湿致变色及 c) 温致变色 [5] Fig. 3 Intelligent color-changing textiles a) photochromic, b) wetchromic and c) thermochromic [5] color changing



图 4 多地形迷彩作战服 [6] Fig.4 Multi-terrain camouflage combat suit [6]

### Important Development of Intelligent Textiles

#### **Energy Harvesting and Storage**

The future intelligent textiles should be more smart and independent to realize the diversity of their functions. Self-powered intelligent textiles have been further developed due to the development of energy harvesting equipment such as solar cells, triboelectric nanogenerators, thermoelectric devices and the improvement of flexible energy storage technology of lithium-ion batteries and supercapacitors. In 2016, Chen et al. [3] developed a micro-cable power textile for simultaneously harvesting energy from ambient sunshine and mechanical movement. Solar cells fabricated from lightweight polymer fibres into micro cables are then woven via a shuttle-flying process with fibre-based triboelectric nanogenerators to create a smart fabric, as shown in Figure 1. The electricity provided by a small piece of textile can charge 2 mF commercial capacitors to 2 V in 1 minute, directly charge the mobile phone, and even power the electronic watch continuously. Professor Shen Guozhen [4], from the team of Institute of Semiconductors, Chinese Academy of Sciences, has developed a 1.2m-long braidable fibrous supercapacitor. As shown in Figure 2, the fibrous supercapacitor functions as a wearable energy storage unit and provide power for personal electronic equipment, showing its great application prospect.

#### Intelligent Color Changing

Color plays a vitally important role in the world in which we live. People express their emotions and tell stories by designing colorful patterns and styles using simple and imaginative color combinations. In recent years, people's aesthetic level for clothing is getting higher, leading to the changing role of the clothing color from practical to novel type. . With the application of advanced technologies in the color-changing areas, the colors and patterns of smart clothing can change in response to the external stimuli such as light, humidity and temperature, which make it possible for the traditional "static colors" transferring to looming dynamic colors (Figure 3). Color-changing clothing was first developed by the United States Department of Defense as an "invisibility cloak" for soldiers, which can change colors with the surrounding environment to simulate the background color of different combat terrain environments, as shown in Figure 4. Since then, color-changing clothing has gradually been applied to other fields. For example, researchers [6] at Clemson University in the United States combined optical fibers with color-changing dyes such as thiophene derivatives to achieve automatic changes in fiber color.



图 5 a) 热响应变形织物 [7] 及 b) 湿度敏感型旗袍 [8] Fig.5 a) Thermal responsive deformed fabric [7] and b) humidity-sensitive cheongsam [8]



图 6 a) Mimo 智能婴儿连体衣 [9], b) 动作捕捉传感器 [10] 及 c) 老人摔倒预警 [11] Fig. 6 a) Mimo intelligent baby one-piece suit [9], b) action capture sensor [10] and c) fall warning for the elderly people [11]

#### 智能变形

可变形材料在受到磁场、电流、辐射、热量和大气等外界刺激时,可以可逆地改变其位置或形状。21世纪以来,新型可变形材料在仿生器件、仿生技术、时尚装饰等领域得到了广泛的研究和应用,如形状记忆高分子材料、合金材料、相变材料等。近年来,人们对基于纺织品的变形材料的研究取得了很大进展。如图 5 所示,Carter S. Haines等<sup>[7]</sup>通过巧妙的编织得到热响应性变形织物,能够根据温度变化改变孔隙率,增加穿着舒适性或保护应急响应人员免受高温。笔者课题组研发了湿度敏感、可舒张卷曲的全氟磺酸离子聚合物 (PFSA) 薄膜<sup>[8]</sup>,利用不均匀吸水膨胀的特性模拟了自然界中花瓣随湿度变化呈现不同形状的行为,并成功将其与旗袍结合制作出变形旗袍。

#### 柔性传感

传统的传感器是一种能将非电量信号按一定规律转换成便于处理的电信号并将其输出的器件,通常由敏感元件、转换元件和测量电路 3 部分组成。智能服装和可穿戴技术的广泛应用使得传感器逐渐向柔性化、智能化、微型化和集成化的方向发展。图 6a 介绍了搭载英特尔 Edison 芯片的 Mimo 智能婴儿连体衣,其内置温度传感器,可监测婴儿的呼吸、皮肤温度、湿度和活动等,通过蓝牙与手机连接后可查看数据,从而更方便照顾婴儿。此外,以摩擦纳米发电机与纤维传感的技术结合则能提供自供能的实时监测系统,在动作捕捉【10】,老人摔倒预警【11】等方面具有潜在应用。

### Intelligent Deformation

Deformable materials can reversibly change their positions or shapes when exposed to external stimuli such as magnetic fields, current, radiation, heat, atmosphere, etc. Since the twenty-first century, new deformable materials have been widely researched and applied in bionic devices, bionic technology, fashion decoration and other fields, such as shape memory polymer materials, alloy materials, phase change materials, etc. In recent years, researchers have made great progress in the study of textile-based deformable materials. As shown in Figure 5, Carter S. Haines et al. [7] obtained thermal responsive deformed fabric through ingenious weaving, which can change the porosity according to temperature change, improve wearing comfort or protect emergency responders from intense heat. The author' group fabricated a moisturesensitive, diastolic and curable perfluorosulfonic acid ion polymer (PFSA) film [8]. Owing to the characteristics of uneven water absorption to expansion, this PFSA film simulated the behavior of petals, changing its shape in response to the environmental humidity. By using this film, deformable cheongsam were successfully designed and fabricated..,

#### Flexible Sensing

The traditional sensor is a kind of device which can convert the non-electrical signal into the processable electrical signal and then output the electrical signal according to certain rules. The system is usually composed of three parts: the sensitive component, the transduction component and the measuring circuit. The widespread application of intelligent clothing and wearable technology has made sensors gradually develop towards the direction of flexibility, intelligence, miniaturization and integration. The Mimo intelligent baby one-piece suit equipped with Intel Edison chip is introduced in Figure 6a. Its built-in temperature sensor can monitor the baby's breath, skin temperature, humidity, activity, etc., and the data can be viewed after connecting with the mobile phone through Bluetooth, making it more convenient to care for the baby. In addition, the combination of triboelectric nanogenerator and fiber sensing technology can provide a self-powered real-time monitoring system, which has potential applications in action capture [10], fall warning for the elderly people [10], etc.

#### 智能纺织品的发展前景

随着业界和学术界对智能纺织品的兴趣日益浓厚, 预计智能纺织品领域将会继续扩大。表1总结了智能服 装技术的组成部分、智能服装可以提供的服务以及应用 实例。智能服装系统的各个组成部分,包括界面、通信、 数据管理、能量管理和集成电路,被组合在一起,形成 信息、通信、辅助、审美、情感等服务。在未来,智能 服装的领域可能会从一个以功能为导向的系统扩展到一 个不仅执行穿着者的指令还关注穿着者的情感状态的系 统。它可以感知穿着者的感受,并通过改变形状、颜色、 气味等来响应情绪。

前边讨论的那些已经上市的智能服装产品主要在服 装中嵌入单一的服务或功能,未来智能服装系统的研究 将向外扩展,将各种服务或功能整合到系统中,生产出 多功能的智能服装系统。

表 1 智能服装技术、服务与应用 [12] Table 1 Intelligent clothing technology, service and application [12]

	_						
		Technology					
						Integrated circuit	
Service			Position tracking jacket with GPS				
			Bio-monitoring garment				
			Mobile phone jacket				
		Photonic dress					
			Sensor Sleeve				

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#### **Development Prospects of Intelligent Textiles**

With the increasing interest of the industry and academia in intelligent textiles, it is expected that the field of intelligent textiles will continue to expand. The components of intelligent clothing technology, services that intelligent clothing can provide, and application examples are summarized in Table 1. All components of the intelligent clothing system, including interface, communication, data management, energy management and integrated circuit, are combined to provide information, communication, auxiliary, aesthetic, emotional and other services. In the future, the field of intelligent clothing may expand from a function-oriented system to a system that not only executes the instructions of the wearer but also pays attention to the emotional state of the wearer. It can sense the wearer's feelings and respond to emotions by changing shape, color, smell, etc.

The listed intelligent clothing products discussed above are mainly embedded with one single service or function in the clothing. In the future, the research of intelligent clothing system will expand outward, integrating various services or functions into the system to produce a multi-functional intelligent clothing system.

<sup>[8]</sup> https://mp.weixin.qq.com/s/ahdSYtuOZ4Xe6w8ez-nUdg.

<sup>[9]</sup> 佚名. 搭载英特尔 Curie 穿戴模块的智能变形服装. 中国制衣 , 2015(10):54. Anonymity. Intelligent deformation clothing equipped with intel curie wearing module. Chia Apparel, 2015(10):54.

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<sup>[11]</sup> Guo, Y et al. All-fiber hybrid piezoelectric-enhanced triboelectric nanogenerator for wearable gesture monitoring. Nano Energy, 2018, 48:152-160.

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# 可穿戴压力传感织物

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随着智能终端的快速普及,目前柔性可穿戴电子的应用已经体现在人类生活的很多方面,被广泛应用于可植入医疗器件、可穿戴健康监测设备等医疗领域。在过去的几年里,基于表皮贴附器件、织物器件以及可伸缩器件,柔性电子技术在非侵入式的健康监测方面已取得了重大进展,为疾病的预防、保健和早期诊断提供了以前无法获得的关键人体生理信息。因此,可穿戴健康监测装置对于实时、不间断、舒适地监测人体重要生理信号具有特殊的意义。其中,可穿戴柔性压力传感器,由于其具有简单的传感结构,可以通过改变与身体接触程度(压力或震动的方式),直接将压力信号转换为电子或光学读数,监测人体多种生理指标,包括动脉脉搏波形、跟踪心率变化、记录呼吸模式以及分析肌肉运动和身体运动等,受到当前商业和学术界越来越多的关注。一种典型的监测方式是首先通过柔性压力传感器测量人的动脉脉搏波形信号,再通过蓝牙等模块传输到移动通信终端或基于云端的平台,即可以直接被强大的人工智能系统计算处理,分析出诸如血压状况、血管硬化情况、心理压力、突发心血管疾病等重要健康信息,并通过健康专家远程评估和监测受试者的健康状况,从而可以准确预知和提前预防一些重大疾病,消除疾病隐患。

terminals, application of flexible wearable electronic products is now reflected in various aspects of human life, and the wearable electronic products are widely applied to medical fields such as implantable medical instruments and wearable health monitoring devices. In the past several years, a significant process has been made in the aspect of non-intrusive-type health monitoring of the flexible electronic technology based on surface fitting devices, fabric devices and telescopic devices, which provides key human physiology information which is unacquirable previously for disease prevention, health care and early diagnosis. Therefore, the wearable health monitoring devices have special significance in monitoring important human physiology signals in real time, uninterruptedly and comfortably, wherein thanks to their simple structures, the wearable flexible pressure sensors can directly switch pressure signals into electronic or optical reading by changing the degree of contact with the body (by means of pressure or vibration) to monitor various human physiology indicators such as arterial pulse waveforms, track heart rate change, record respiratory patterns, and analyze muscular movement and body movement. It has attracted more and more attention from the current business and academic circles. One typical monitoring mode is to first measure the waveform signals of human artery pulses through flexible pressure sensors, and then transmit the signals to mobile communication terminals or cloud-based platforms through Bluetooth and other modules. In this way, the signals can be directly subjected to calculation processing by a powerful artificial intelligence system to analyze important health information like the blood pressure, vascular sclerosis, psychological pressure, sudden cardiovascular diseases. Meanwhile, through the remote assessment and monitoring of the health status of the subjects by health experts, some major diseases can be accurately predicted and prevented in advance, so that the hidden dangers of diseases are eliminated.

Nowadays, along with rapid popularization of intelligent



#### 主动供电压力传感技术

尽管可穿戴电子器件的研究取得了快速发展,但要将这个新兴技术快速融入到百姓生活中,仍然存在一些技术问题和理论瓶颈。当前可穿戴压力传感器主要面临两个方面的问题:一是传感器自身所用材料,在满足高灵敏检测的同时还需要具有柔韧性及舒适性;二是动力电源,传感器将物理信号转换为电信号并且传输到分析平台需要外部电路和芯片,而这些需要外界供电才能运行。柔性传感器的供电系统是通过外接电源或刚性的锂离子电池,而作为可穿戴器件,后者是更优的选择。但是广泛使用的锂电池的不足之处在于其较大的体积和整体的刚性,器件整体无法保持柔性,不便于佩戴和紧密贴附。即便是使用近年来兴起的柔性锂离子电池,作为贴身之物,其在生物相容性和环保方面也会存在一定的安全隐患。此外柔性锂电池的封装限制了其柔软度,相比于织物等常规可穿戴材料的柔软性相差甚远。

为了解决当前可穿戴压力传感器面临的上述挑战,中国科学院深圳先进技术研究院仿生触觉与智能传感研究中心开发了一种可穿戴的主动供电压力传感织物器件,将具有生物相容性的柔软锌空气电池动力单元与基于织物结构的压力传感单元融为一体化,形成全柔性器件架构。无需外接电源,器件自身可提供柔软、舒适和可靠的人类-传感界面及对外部电路和芯片持续供电能力,用于便携舒适的可穿戴人体生理和活动监测等实际应用,同时解决了当前压力传感器面临的材料舒适性和需额外供电两大问题。

In spite of rapid development achieved on the study of wearable electronic devices, there are still some technical problems and theoretical bottlenecks before the emerging technology can be quickly merged into the life of common people. At present, wearable pressure sensors are mainly faced with two problems. On one hand, besides the capability of high sensitivity detection, the materials adopted for the sensors need to have flexibility and comfort; on the other hand, there is the problem of power since the sensors need to conduct the operation of converting physical signals into electric signals and transmitting the electric signals to an analysis platform with the assistance of external circuits and chips which cannot run without external power supply. The power supply system of the flexible sensors is an external power source or a rigid lithium-ion battery, the latter of which is regarded as a wearable device and becomes a better choice. However, the wide application of the lithium battery has the shortcomings that the size and overall rigidity of the battery are large, the device cannot keep flexibility as a whole, and wearing and close fitting are not facilitated. Even if the flexible lithium-ion battery which has been emerging in the recent years is applied as a fitting substance, there are still certain hidden safety hazards of the flexible lithium-ion battery in the aspects of bio-compatibility and environmental protection. Besides, the flexibility of the flexible lithium battery is limited by encapsulation of the flexible lithium battery, and the flexible lithium battery has flexibility far lower than that of fabric and other conventional wearable materials.

In order to deal with the above-mentioned challenges of current wearable pressure sensors, The bionic tactile and intelligent sensing research center of Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences has developed a wearable active power supply pressure sensing fabric device which integrates a flexible soft zinc-air battery power unit with bio-compatibility and a sensing sensor unit based on a fabric structure to form a full-flexibility device framework. Without the external power source, the device itself can provide a soft, comfortable and reliable human-sensing interface and the capability of continuously supplying power to the external circuits and chips, which can be used for practical applications such as portable and comfortable wearable human physiology and activity monitoring, and solves the two major problems of material comfort and additional power supply faced by the current pressure sensors.

相关论文 "Active-powering pressure-sensing fabric devices" 发表在国际著名学术期刊《Journal of Materials Chemistry A》 上(J. Mater. Chem. A, 2020, 8, 358-368.) 。 这种主动供电压力传感器件由五层 不同功能纤维布和功能材料组成, 其中上三层构成了锌空气电磁动力 单元,下三层构成了压力传感单元, 并与动力单元共用一层织物电极 (图 1)。器件整体厚度在 0.7mm 以下, 并保持了织物的柔软透气的功能。 将这种织物通过剪裁, 并与蓝牙传 输电路连接, 主动供电织物除了可 以为自身传感提供能量外, 还可以 驱动外接的蓝牙电路,将传感器 得到的生理信号读取并无线发射出 去。这种织物被制备成创可贴的形 式,并用于手腕、颈部、脚面的脉 搏波传感中,可以提供长达 24 小时 的无间断生理信号监测(图 2)。此外, 将主动供电压力传感织物粘接到手 指、手腕等关节或肌肉运动处,通 过传感出运动时候的肌肉收缩、拉 伸、蠕动,可以判断出人的运动意图, 为手势识别、运动监测等应用提供 可长时间工作的,穿戴舒适的硬件

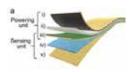


图 1: 钛深科技的可穿戴健康监测鞋 Fig1: Wearable health monitoring shoes of TacSense Technology (Shenzhen) Co., Ltd.

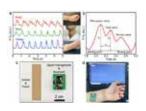


图 2: 足背的肌肉及动脉系统: i, iii, iv, v-足背肌腱; ii- 足背动脉, 动脉可作为肌 腱定位的空间参考

Fig. 2: Muscle and artery systems of foot dorsum: i,iii,iv,v-foot dorsum tendons; ii-arterial dorsalis pedis. Arteries can be regarded as spatial references for tendon positioning

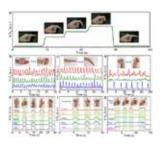


图 3. 主动供电可穿戴传感织物器件实现 肌肉蠕动检测及手势识别 (注:源自 J. Mater. Chem. A, 2020, 8, 358-368.)

Fig.3 Active power supply wearable sensing fabric device for muscle peristalsis detection and gesture recognition (Note: from J. Mater. Chem. A, 2020, 8, 358–368.)

基础(图3)。

The related paper "Active-powering pressure-sensing fabric devices " was published in the international famous academic journal Journal of Materials Chemistry A (J. Mater. Chem. A, 2020, 8, 358–368.). The active power supply pressure sensor consists of five layers of different functional fiber cloth and functional materials, wherein the upper three layers constitute the zinc-air electromagnetic power unit, and the lower three layers constitute the pressure sensing unit, and the pressure sensing unit shares one layer of fabric electrode with the power unit (Fig.1). The overall thickness of the device is less than 0.7mm, and the functions of softness and breathability can be kept. By cutting the fabric and connecting it with the Bluetooth transmission circuit, the active power supply fabric can not only provide energy for its own sensor, but also drive the external Bluetooth circuit, read the physiological signals acquired by the sensor and transmit it wirelessly. This kind of fabric is made into the form of band aids and used in the pulse wave sensing of the wrists, necks and insteps, which can provide continuous physiological signal monitoring for up to 24 hours (Fig. 2). In addition, the active power supply pressure sensing fabric is bonded to the joints of the fingers and wrists and the like or muscle movement parts, by sensing muscle contraction, stretching and peristalsis during the movement, the movement intention of people can be judged, and thus a hardware foundation which can work for a long time and is comfortable to wear can be provided for the application of gesture recognition, movement monitoring and other applications (Fig. 3).

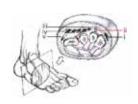


图 2: 足背的肌肉及动脉系统: i, iii, iv, v-足背肌腱; ii-足背动脉,动脉可作为肌腱定位的空间参考 Fig.2: Muscle and artery systems of foot dorsum: i,iii,iv,v-foot dorsum tendons; ii-arterial dorsalis pedis. Arteries can be regarded as spatial references for tendon positioning



图 1: 钛深科技的可穿戴健康监测鞋 Fig1: Wearable health monitoring shoes of TacSense Technology (Shenzhen) Co., Ltd.

#### 基于足部的可穿戴健康监测系统

目前手腕是智能可穿戴设备中被关注最多的部位,但有三方面痛点未被解决:一方面是手表、手环等外置设备用户容易忘记佩戴;二是这些可穿戴设备中使用的结构和材料可能是硬质接触皮肤式的,长期佩戴会有不适感;三是它们测量的数据仍然不够准确。加州大学戴维斯分校潘挺睿教授课题组联合钛深科技(深圳)有限公司开发出了全球首款基于足部的智能可穿戴设备-可穿戴智能鞋。有别于以往智能手表、手环等智能可穿戴设备,鞋子中集成了全新一类传感技术"柔性离电式传感技术"的压力传感器,可实现更准确、更舒适的脉搏信号和肌肉活动监测。该产品在今年美国拉斯维加斯国际消费类电子产品展览会(CES2020)上受到了高度的肯定,并获得了今年的 CES 创新奖。

目前市面上可监测人体生理数据的手表手环多采用光学测量原理 (PPG),是一种间接方式的测量,需要长期接触皮肤,并且容易受到外界环境光的影响。另外一些新兴的运用心电图技术 (ECG)的手表则必须要通过保障双手都接触到外置的电极才能工作,无法实现连续测量。而柔性离电式传感技术是直接测量脉搏波动的压力信号且分辨率更高,透过一层衣物也仍然可以探测到高质量的生理信号。此外,人体足部包含着丰富的脉管系统,强壮的肌腱和肌肉,以及特有的骨骼结构。这意味着压力传感器可以采集到更丰富的信息。鞋是人们日常所不可缺少的穿着配件,基于综合考虑,足部的可穿戴设备才是最理想的。

#### Foot-based wearable health monitoring system

At present, the wrist is the most concerned part in intelligent wearable devices, but there are three aspects of problems which have not been solved yet. Firstly, the users of external devices such as watches and bracelets are liable to forget to wear their devices; secondly, the structures and materials used in these wearable devices may be a hard skin-contact type, which may cause discomfort for longterm wear; and thirdly, the data measured by these external devices are still not accurate enough. The research group of Professor Pan Tingrui from the University of California, Davis and TacSense Technology (Shenzhen) Co., Ltd. have developed the world's first foot-based intelligent wearable device-wearable intelligent shoes. Different from previous intelligent watches, bracelets and other intelligent wearable devices, a brand-new kind of pressure sensors based on the sensing technology "flexible off-electricity sensing technology" are integrated in the shoes, which can achieve more accurate and more comfortable monitoring on pulse signals and muscular movement. The product was highly recognized at this year's International Consumer Electronics Show (CES2020) in Las Vegas, and won this year's CES Innovation Award.

At present, the watch bracelets which can monitor the physiological data of human body on the market mostly adopt the principle of optical measurement (PPG), which is an indirect way of measurement. However, the watch bracelets need to contact the skin for a long term and are easily affected by the external environment light. In addition, some emerging watches applying the ECG technology cannot work only when it is ensured that both hands are in contact with external electrodes, and cannot achieve continuous measurement. Compared with the ECG technology, the flexible ionization sensing technology can achieve direct measurement on pressure signals of pulse fluctuation with higher resolution, and physiological signals with high quality can still be detected even if the devices need to pass through a layer of clothing. In addition, the human fee contains a rich vascular system, strong tendons and muscles, as well as a unique bone structure, which means that the pressure sensor can collect richer information. Shoes are wearing accessories indispensable to people's daily life. Based on comprehensive consideration, the foot-based wearable devices are the most ideal ones.

	Heart Rate Range	45 - 220 8PM
	Heart Rate Accuracy	< 2 BPM
Functions	Respiratory Rate Range	10 - 30 RPM
	Respiratory Accuracy	< 2 RPM
	HRV Analysis	6 Indexes
	Resolution	1 mmHg
	Response Time	< 1ms
Sensor	Working Pressure Range	0 -250 mmHg
	Mechanical Stability	>1,000,000 cycles
	Rechargeable Battery	Last 7 days
Hordware	Case Weight	<11g
	Dimension	1.5" x 1.4" x 0.4"

图 3. 主动供电可穿戴传感织物器件实现肌肉蠕动检测及手势识别 (注:源自 J. Mater. Chem. A, 2020, 8, 358–368.) Fig.3 Active power supply wearable sensing fabric device for muscle peristalsis detection and gesture recognition (Note: from J. Mater. Chem. A, 2020, 8, 358–368.)

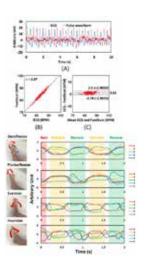


图 4: 传感阵列监测不同的肌腱活动 及对应的动作 Fig.4: Sensing arrays monitor different tendon activities and corresponding actions

作为全球首款基于足部的医疗级智能可穿戴设备,集成了钛深科技所独有的全柔性离电式可穿戴触觉监测模组,能够实现对足部脉搏信号和肌肉运动信号的实时监测。通过心血管系统相关动力学分析以及结合人工智能算法,其能够提供包括心率、呼吸以及血压趋势的全天候连续监测。同时能够通过心率变异性分析,实现神经系统包括情绪、疲劳程度、心理压力等方面的分析,可以用于对帕金森氏症、阿尔茨海默氏症或亨廷顿氏症患者在康复训练时的心血管参数以及运动监测,也可用于如糖尿病患者的足部管护。同样的技术,针对于不同应用场景,钛深科技也能够将其传感模组集成到其他的可穿戴设备中:如头盔、帽子、服饰等。

目前,这款基于足部的智能可穿戴设备的心率提取精度在目前公布的医疗级标准范围内。相关论文 "FeetBeat: A Flexible Iontronic Sensing Wearable Detects Pedal Pulses and Muscular Activities"已发表在生物医学工程著名学术期刊《IEEE Transactions on Biomedical Engineering》上。

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As the first foot-based medical-level intelligent wearable devices on the globe, the foot-based wearable devices integrate full-flexibility ionization-type wearable touch monitoring modules peculiar to the TacSense Technology (Shenzhen) Co., Ltd., and achieve real-time monitoring on foot pulse signals and muscle muscular movement signals. By means of the related kinetic analysis on the cardiovascular system in combination with the artificial intelligence algorithm, all-weather continuous monitoring including the heart rate, respiration and blood pressure tendency can be provided. In the meanwhile, by means of the heart rate variability analysis, analysis on the nervous system in the aspects of emotions, fatigue degree, psychological stress and the like is achieved. The foot-based wearable devices can be used for monitoring cardiovascular parameters and movement of patients suffering from the Parkinson's disease, Alzheimer's disease or Huntington's disease during rehabilitation training, and can furthermore be used for foot care and protection for diabetic patients and other patients. TacSense Technology (Shenzhen) Co., Ltd. can integrate its sensing modules to other wearable devices such as helmets, caps and clothing by means of the same technology according to different application scenarios.

Currently, the heart rate extraction precision of the foot-based intelligent wearable devices is within the published medical-level standard range. The relevant paper FeetBeat: A Flexible Iontronic Sensing Wearable Detects Pedal Pulses and Muscular Activities is already published on the renowned academic journal IEEE Transactions on Biomedical Engineering of biomedical engineering.

<sup>[7]</sup> Haines, Cet al. Artificial muscles from fishing line and sewing thread. Science, 2014, 343(6173):868.

<sup>[8]</sup> https://mp.weixin.qq.com/s/ahdSYtuOZ4Xe6w8ez-nUdg.

<sup>[9]</sup> 佚名. 搭载英特尔 Curie 穿戴模块的智能变形服装. 中国制衣, 2015(10):54.

Anonymity. Intelligent deformation clothing equipped with intel curie wearing module. Chia Apparel, 2015(10):54.

<sup>[10]</sup> Gong, W et al. A wearable, fibroid, self-powered active kinematic sensor based on stretchable sheath-core structural triboelectric fibers. Nano Energy, 2017, 39:673-683.

<sup>[11]</sup> Guo, Y et al. All-fiber hybrid piezoelectric-enhanced triboelectric nanogenerator for wearable gesture monitoring. Nano Energy, 2018, 48:152-160.

 $<sup>[12] \</sup> Cho, Get al.\ Review and reappraisal of smart clothing.\ International Journal of Human-Computer Interaction, 2009, 25(6):582-617.$ 

# 盛虹·中国纤维流行趋势 入选纤维 2020/2021 Shenghong · China Fibers Fashion Trends Issue Products

入选纤维	纤维名称	企业	品牌
	聚乳酸纤维	安徽丰原生物材料股份有限公司	柠檬果园
生物基	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司	元丝
化学纤维		中纺院绿色纤维股份公司	绿纤
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司	瑛赛尔
	循环再利用 PET/PBT 双组份弹性复合纤维	盛虹集团・国望高科	BEY
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司	GREEN CILCLE
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司	百川
	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司	恒力
循环再利用 化学纤维	ATT TO THE BOTTLE DAY OF ATTA	广东新会美达锦纶股份有限公司	再生尼龙
10十二年	循环再利用聚酰胺 6 纤维	长乐恒申合纤科技有限公司	恒申
	循环再利用再生纤维素纤维	唐山三友集团兴达化纤有限公司	三友集团
	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司	瑞优丝
	循环再利用氨纶	浙江华峰氨纶股份有限公司	千禧
原液着色	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司	雅达
化学纤维	原液着色 PE-PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司	蒙泰丝
	纤•巧思		
	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司	鹭洁丝
	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司	锦江科技
功能纤维	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司	周导
	中空异形再生纤维素纤维	山东银鹰化纤有限公司	木叶
		恒天中纤纺化无锡有限公司	中纤
	抗熔滴永久阻燃聚酰胺纤维	上海安凸阻燃纤维有限公司	上海安凸
阻燃纤维	地毯用阻燃聚酰胺 6 纤维	浙江四通新材料科技股份有限公司	四通
	阻燃高强聚酰胺 66 纤维	中维化纤股份有限公司	中维
	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司	尤夫
	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司	江西先材
医疗卫生用	静电纺聚丙烯腈纳米纤维	河南中纤新材料科技有限公司	纳纤新材
纤维	熔喷驻极聚丙烯微纳纤维	天津工业大学、天津科技大学	
	海藻纤维	青岛源海新材料有限公司	海之棉
	——————————— 纤•质尚		
	高仿真丝聚酯纤维	桐昆集团浙江恒腾差别化纤维有限公司	桐昆
+7 7 / T / P	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司	逸黛
轻柔纤维	一步法多孔细旦聚酰胺 6 纤维	义乌华鼎锦纶股份有限公司	华鼎锦纶
	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司	臻丝
	牛仔用高弹性氨纶	杭州邦联氨纶股份有限公司	PT 氨纶
弹性纤维	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司	奥神
	纤•鼎制		
	QM4035 高强高模碳纤维	威海拓展纤维有限公司	拓展
高性能	SYM40 高强高模碳纤维	中复神鹰碳纤维有限责任公司	神鹰
化学纤维	压力容器用 HF30F 碳纤维	江苏恒神股份有限公司	恒神
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司	甲纶

Category	Product Name	Company	Brand	
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.	Lemon Orchard	
Bio-Based Chemical	New-Solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.	Oricell	
Fiber	New-Solvent Based Regenerated	China Textile Academy Green Fibre Co., Ltd.	Grecell	
	Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.	Incell	
	Recycled Pet/ Pbt Bicomponent Elastic Composite Fiber	Shenghong Group · Guowang High-Tech	Bey	
	Recycled Cationic Modified Pet Fiber	Zhejiang Jiaren New Materials Co., Ltd.	Green Cilcle	
	Dope Dyed Recycled Waterproof Pet Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.	Baichuan	
Recycled	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.	Hengli	
Chemical Fiber	Particled DAC Fiber	Guangdong Xinhui Meida Nylon Co., Ltd.	Recycled Nylon	
Linei	Recycled PA6 Fiber	Changle Hengshen Hexian Technology Co.,Ltd.	Hsc	
	Recycled Cellulose Fiber	Tangshan Sanyou Group Xingda Chemical Fibre Co., Ltd.	Sanyou Group	
	Recycled Acrylic Fiber	Hebei Eric Fiber Co., Ltd.	Rca	
	Recycled Spandex	Zhejiang Huafon Spandex Co., Ltd.	Qianxi	
Dope Dyed	Dope Dyed Pa6 Fiber With Low Fineness	China Resources Yantai Nylon Co., Ltd.	Yada	
Chemical Fiber	Dope Dyed Pe-Pp Sheath-Core Fiber	Guangdong Modern High-Tech Fiber Co., Ltd.	Moderns	
	Fiber · exquisite C	reativity		
	Zinc Antibacterial Pet Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.	Lu Clean	
	Nano-Photocatalytic Pa6 Fiber Of Anti- Bacterial And Deodorant Functions	Fujian Jinjiang Technology Co., Ltd.	Jinjiang Technology	
Functional Fiber	Sheath-Core Conductive Pet Fiber Modified With Carbon Nanotubes	Jiangsu Zja New Material Co.,Ltd.	Zhou Dao	
	Regenerated Hollow-Shaped And Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.	Bt-Hollow	
	Anti-Dripping And Permanent Flame- Retardant Pa Fiber	Chtc Sinofiber Wuxi Co., Ltd.	Sinofiber	
		Shanghai Antu Fr Fibers Co., Ltd.	Antu	
Flame- Retardant Fiber	Flame-Retardant Pa6 Carpet Fiber	Zhejiang Sitong New Material Technology Co., Ltd.	Sitong	
Fiber	Flame-Retardant And High-Strength Pa66 Fiber	Sinowin Chemical Fiber Co., Ltd.	Sinowin	
	Flame-Retardant And High-Strength Polyester Industrial Yarn	Zhejiang Unifull High-Tech Fiber Co., Ltd.	Unifull	
	Polyimide Nanofiber Aerogel Membrane By Electrospinning	Jiangxi High-Nanofiber S&T Co.,Ltd	Hinanofiber	
Protective Fiber For	Polyacrylonitrile Nanofiber By Electrospinning	Henan Zhongxian New Material Technology Co., Ltd.	Naxian New Materials	
Medical And Health	Polypropylene Micro-Nanofiber By Melt- Blow Electret	Tiangong University Tianjin University Of Science & Technology		
	Alginate Fiber	Qingdao Yuanhai New Material Technology Co. , Ltd.	Hicel	
	Fiber · stylish D	esign		
	High-Imitated-Silk Pet Fiber	Tongkun Group Zhejiang Hengteng Differential Chemical Fiber Co., Ltd.	Tongkun Group	
Soft Fiber	Cationic Easy-Dyeing Porous Fine- Denier Polyester	Zhejiang Hengyi Petrochemical Co., Ltd.	Hengyi	
SUIT FINEI	Multiporous Fine–Denier Pa6 Fiber Using One Step Method	Yiwu Huading Nylon Co.,Ltd.	Huading	
	Fine-Denier Polyacrylonitrile Filament	Changshu Xiangying Special Fiber Co., Ltd.	Silkfeel	
E1 .1 E1	High-Elastic Spandex For Denim	Hangzhou Banglian Spanex Co., Ltd.	Pt Stretchtm	
Elastic Fiber	Sustained-Release Mosquito Repellent Scented Spandex	Ldz New Aoshen Spandex Co., Ltd.	Aoshen	
	Fiber - top Manufacture			
	Qm4035 High Strength And High Modulus Carbon Fiber	Weihai Tuozhan Fiber Co., Ltd.	Tz	
High- Performance	Sym40 High Strength And High Modulus Carbon Fiber	Zhongfu Shenying Carbon Fiber Co., Ltd.	Sy	
Chemical Fiber	Hf30f Carbonfiber For Pressure Vessels	Jiangsu Hengshen Co., Ltd.	Hs	
Tibel	Dyeable Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.	Fitlon	

#### 盛虹·中国纤维流行趋势 入围纤维

#### Shenghong · China Fibers Fashion Trends Recommended Products

品类	入围纤维	品牌	企业
仿真纤维	仿麻聚酯纤维	桐昆	桐乡市恒基差别化纤维有限公司
// // // // // // // // // // // // //	亲水易染复合聚酯纤维	斯绵	徐州斯尔克纤维科技股份有限公司
高性能化学纤维	高强高模聚酰亚胺纤维	轶纶	长春高琦聚酰亚胺材料有限公司
向住肥化子纤维	芳砜纶	特安纶	上海特安纶纤维有限公司
	氧化锌聚酯纤维	GINTER HILL	博富科技股份有限公司
T-L AK AT AA	低纤度低熔点聚酰胺 6 纤维	恒申	长乐恒申合纤科技有限公司
功能纤维	低纤度石墨烯改性聚酰胺 6 纤维	烯纳斯	常州恒利宝纳米新材料科技有限公司
	天然矿物质添加改性聚酰胺 66 纤维	银珠	辽宁银珠化纺集团有限公司
轻柔纤维	细旦多孔扁平聚酯纤维	金鸡	桐乡市中洲化纤有限责任公司
在朱纤维	超细聚乙烯纤维	酷纺、酷艺	凯泰特种纤维科技有限公司
生物基化学纤维	无卤阻燃原液着色聚乳酸纤维	御丝	河南省龙都生物科技有限公司
弹性纤维	超细多孔弹性聚酯纤维	泉迪	宁波泉迪化纤有限公司
坪注纤维	PBT/PET 并列复合弹性纤维	天翼	洪泽联合化纤有限公司
	地毯用循环再生聚酯纤维	Longfu	龙福环能科技股份有限公司
循环再利用 化学纤维	仿皮草循环再生聚酯长丝	如盛	苏州春盛环保纤维有限公司
	低温阳离子循环再生聚酯纤维	午和纤维	江苏垶恒复合材料有限公司
	生物基 PHBV-PLA 复合纤维	禾素	宁波禾素纤维有限公司
医空卫生甲红体	银、锌双复合抑菌聚乳酸纤维	德福伦	上海德福伦纤维有限公司
医疗卫生用纤维	纳米聚酯纤维	愉悦	愉悦家纺有限公司
	纳米聚丙烯腈纤维	富瑞邦	嘉兴富瑞邦新材料科技有限公司
	细旦原液着色聚酰胺 6 纤维	凯邦	福建凯邦锦纶科技有限公司
	细旦多孔原液着色聚酰胺 6 纤维	免染彩锦 ATY 纱	浙江嘉华特种尼龙有限公司
原液着色 化学纤维	植物基原液着色再生纤维素纤维	圣桑	宜宾惠美纤维新材料股份有限公司
	仿棉原液着色聚乳酸纤维	昌新逸丝	嘉兴昌新差别化纤维科技有限公司
	原液着色聚丙烯腈纤维	白山	河北吉藁化纤有限责任公司
	阻燃原液着色聚酰胺 6 纤维	CESALON	上海安凸阻燃纤维有限公司
阻燃纤维	绿化用原液着色无卤阻燃聚酰胺 66 单丝	多力隆	昆山力泰纤维有限公司
	远红外抑菌硅氮系阻燃再生纤维素纤维	SOLFR	北京赛欧兰阻燃纤维有限公司

Cateoory	Recommend Products	Brand	Enterprise
lasitated Files	Linen-like polyester fiber	Tongkun	Tongxiang Hengji Differential Fiber Co., Ltd.
Imitated Fiber	Hydrophilic and dyeable composite polyester fiber	simian	Xuzhou Silk Fiber Technology Co., Ltd.
High- performance	High-strength and high modulus polyimide fiber	Yi Lun	Changchun Gaoqi Polyimide Materials Co., Ltd.
Chemical Fiber	Polysulfonamide(PSA)	Te Anlun	Shanghai Te Anlun Fiber Co., Ltd.
	Zinc oxide polyester fiber	GINTER HILL	Bilic-Fortune Technology Co,. Ltd.
F	Low- fineness, low-melting polyamide 6 fiber	Hengshen	Changle Hengshen Synthetic Fiber Technology Co., Ltd.
Functional Fiber	Low- fineness graphene-modified polyamide 6 fiber	Xinasi	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Modified polyamide 66 fiber with natural minerals	Yinzhu	Liaoning Yinzhu Chemtex Group Co., Ltd.
0-ft Fib	Fine denier flat polyester multifilament	GOLDENCOCK	Tongxiang Zhongzhou Chemical Fiber Co., Ltd.
Soft Fiber	Ultra-fine polyethylene fiber	Kufang, Kuyi	Kaitai Special Fiber Technology Co., Ltd.
Bio-based Chemical Fiber	Halogen-free flame retardant dope-dyed polylactic acid fibers	Yusi	Henan Longdu Biotechnology Co., Ltd.
Flantin Fiber	Superfine elastic polyester multifilament	Quan Di	Ningbo Quan Di Chemical Fiber Co., Ltd.
Elastic Fiber	PBT / PET side-by-side composite elastic fiber	Tianyi	Hongze Lianhe Chemical Fiber Co., Ltd.
	Recycled polyester fibers for carpet	Longfu	Long Fu Environmental Energy Technology Co., Ltd.
Recycled Chemical Fibers	Imitation fur recycled polyester filament	Rusheng	Suzhou Chunsheng Environmental Fiber Co., Ltd.
	Low-temperature cationic recycled polyester fiber	Wuhe Fiber	Jiangsu Yongheng Composite Materials Co., Ltd.
	PHBV-PLA Bio-based Composite Fiber	Hesu	Ningbo Hesu Fiber Co., Ltd.
FIBERS FOR MEDICAL CARE AND	Bacteriostatic Polylactide Silver–Zinc Composite Fiber	Different	Shanghai Different Chemical Fiber Co., Ltd.
PUBLIC HEALTH	Polyester Nanofiber	Yuyue	Yuyue Home Textile Co., Ltd.
	Polyacrylonitrile Nanofiber	Furuibang	Furuibang New Materials Technology Co., Ltd.
	Fine denier dope dyed polyamide 6 fiber	Kaibang	Fujian Kaibang Nylon Technology Co., Ltd.
Dope Dyed Chemical Fiber	Fine denier dope dyed polyamide 6 multifilament	Dye-free colorful brocade ATY yarn	Zhejiang Jiahua Special Nylon Co., Ltd.
	Plant-based dope dyed regenerated cellulose fiber	Sheng Sang	Yibin Huimei Fiber New Material Co., Ltd.
	Imitation cotton dope dyed polylactic acid fiber	Changxin Yisi	Jiaxing Changxin Differential Fiber Technology
	Dope dyed polyacrylonitrile fiber	Baishan	Hebei Jigao Chemical Fiber Co., Ltd.
	Flame retardant dope dyed polyamide 6 fiber	CESALON	Shanghai Antu Flame Retardant Fiber Co., Ltd
Flame Retardant	Halogen–free flame–retardant dope dyed polyamide 66 monofilament for greening	Duolilong	Kunshan Litai Fiber Co., Ltd.
Fiber	Far-infrared antibacterial Si-N flame retardant regenerated cellulose fiber	SOLFR	Beijing SOL Flame-Retardant Fiber Co., Ltd.

应用领域	推荐纤维品种	企业
应用视线	据存红维加州	安徽丰原生物材料股份有限公司
	乗孔敞纤维 细旦新溶剂法再生纤维素纤维	安徽丰原王初材科股份有限公司 保定天鹅新型纤维制造有限公司
	细旦剂冶剂从丹土纤维系纤维	中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司
	循环再利用 PET/PBT 双组份弹性复合纤维	盛虹集团江苏国望高科纤维有限公司 
	循环再利用涂涤复合纤维	江苏恒力化纤股份有限公司
	個外母利用/赤冰麦口纤维 	广东新会美达锦纶股份有限公司
	循环再利用聚酰胺 6 纤维	长乐恒申合纤科技有限公司
休闲服	循环再利用再生纤维素纤维	唐山三友集团兴达化纤有限公司
/ 吸湿透气 /	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
/	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
		桐乡市恒基差别化纤维有限公司
		徐州斯尔克纤维科技股份有限公司
	天然矿物质添加改性聚酰胺 66 纤维	辽宁银珠化纺集团有限公司
	细旦多孔扁平聚酯纤维	桐乡市中洲化纤有限责任公司
	生物基 PHBV-PLA 复合纤维	宁波禾素纤维有限公司 洪泽联合化纤有限公司
	PBT/PET 并列复合弹性纤维	
	低温阳离子循环再利用聚酯纤维	江苏垶恒复合材料有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	循环再利用 PET/PBT 双组份弹性复合纤维	盛虹集团江苏国望高科纤维有限公司
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
	循环再利用氨纶	浙江华峰氨纶股份有限公司
户外运动服	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
/ 吸湿速干 /	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
/高强/	中空异形再生纤维素纤维	山东银鹰化纤有限公司
/ 色彩鲜艳 /	一步法多孔细旦聚酰胺 6 纤维	义乌华鼎锦纶股份有限公司
	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	亲水易染复合聚酯纤维	徐州斯尔克纤维科技股份有限公司
	超细聚乙烯纤维	凯泰特种纤维科技有限公司
	细旦原液着色聚酰胺 6 纤维	福建凯邦锦纶科技有限公司
	细旦多孔原液着色聚酰胺 6 纤维	浙江嘉华特种尼龙有限公司
	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司
	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司 上海安凸阻燃纤维有限公司
安全防护服	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
/ 阻燃 / 耐磨 /	海藻纤维	青岛源海新材料有限公司
/强度高/	银、锌双复合抑菌聚乳酸纤维	上海德福伦纤维有限公司
/抗静电/	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	高强高模聚酰亚胺纤维	长春高琦聚酰亚胺材料有限公司
	远红外抑菌硅氮系阻燃再生纤维素纤维	北京赛欧兰阻燃纤维有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
	又妖空机冷剂法丹土纤维系纤维	山东英利实业有限公司
家居服	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
/ 手感柔软 /	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
/ 亲肤 /	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
,	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司
	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司

#### 服装用纺织品 CLOTHING TEXTILES

Application field	Recommended fiber	Company
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
		China Textile Academy Green Fibre Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
	Recycled Cationic Modified PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Recycled PET / PBT Bicomponent Elastic Composite Fiber	Shenghong Group · Guowang High-tech
	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
	Doguslad DAC Fibox	Guangdong Xinhui Meida Nylon Co., Ltd.
	Recycled PA6 Fiber	Changle Hengshen Hexian Technology Co.,Ltd.
Leisure wear	Recycled Cellulose Fiber	Tangshan Sanyou Group Xingda Chemical Fibre Co., Ltd.
Breathable/	Recycled Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
Soft	Cationic Easy-dyeing Poro us Fine-denier Polyester	Zhejiang Hengyi Petrochemical Co., Ltd.
	Sustained-release Mosquito Repellent Scented Spandex	LDZ New Aoshen Spandex Co., Ltd.
	Linen-like polyester fiber	Tongxiang Hengji Differential Fiber Co., Ltd.
	Hydrophilic and dyeable composite polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	Modified polyamide 66 fiber with natural minerals	Liaoning Yinzhu Chemtex Group Co., Ltd.
	Fine denier flat polyester multifilament	Tongxiang Zhongzhou Chemical Fiber Co., Ltd.
	Bio-based PHBV-PLA Composite Fiber	Ningbo Hesu Fiber Co., Ltd.
	PBT / PET side-by-side composite elastic fiber	Hongze Lianhe Chemical Fiber Co., Ltd.
	Low-temperature cationic recycled polyester fiber	Jiangsu Yongheng Composite Materials Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	Recycled PET / PBT Bicomponent Elastic Composite Fiber	Shenghong Group · Guowang High-tech
	Recycled Cationic Modified PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Dope Dyed Regenerated Waterproof PET Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
	Regenerated Spandex	Zhejiang Huafon Spandex Co., Ltd.
Outdoor	Dope Dyed PE-PP Sheath-core Fiber	Guangdong Modern High-tech Fiber Co., Ltd.
sportswea	Zinc Antibacterial PET Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Fast Dying/	Regenerated Hollow-shaped and Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.
High-	Multiporous Fine-denier PA6 Fiber using one step method	Yiwu Huading Nylon Co.,Ltd.
strength/ Durable Color	Fine-denier Acrylic Fiber	Changshu Xiangying Special Fiber Co., Ltd.
	Mosquito Repellent Scented Spandex	LDZ New Aoshen Spandex Co., Ltd.
	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
	Hydrophilic and dyeable composite polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	Ultra-fine polyethylene fiber	Kaitai Special Fiber Technology Co., Ltd.
	Fine denier dope-coloring polyamide 6 fiber	Fujian Kaibang Nylon Technology Co., Ltd.
	Fine denier dope-coloring polyamide 6 multifilament	Zhejiang Jiahua Special Nylon Co., Ltd.
Safety	Sheath-core Conductive PET Fiber Modified with Carbon Nanotubes	Jiangsu ZJA New Material Co.,Ltd.
protection suit	Anti-Dripping and Permanent Flame-retardant PA Fiber	CHTC Sinofiber Wuxi Co., Ltd.
Flame	Flame-retardant and High-strength Polyester Industrial Yarn	Shanghai Antu FR Fibers Co., Ltd.  Zhejiang Unifull High-tech Fiber Co., Ltd.
Retardant/	Alginate fiber	Qingdao Yuanhai New Material Technology CO. , LTD.
Wear Resistance/	Bacteriostatic Polylactide Silver–Zinc Composite Fiber	Shanghai Defron Chemical Fiber Co., Ltd.
High-	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
strength/Anti- static	High-strength and high modulus polyimide fiber	Changchun Gaoqi Polyimide Materials Co., Ltd.
	Far-infrared antibacterial Si-N flame retardant regenerated	
	cellulose fiber	Beijing SOL Flame-Retardant Fiber Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
Home wear		Shandong Yingli Industrial Co., Ltd.
	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
Soft/ Skin	Recycled Acrylic Fiber  Nano-photocatalytic PA6 Fiber of Anti-bacterial and	Hebei Eric Fiber Co., Ltd.
Friendliness	Deodorant functions	Fujian Jinjiang Technology Co., Ltd.
	Cationic Easy-dyeing Porous Fine-denier Polyester	Zhejiang Hengyi Petrochemical Co., Ltd.
	Fine-denier Polyacrylonitrile Filament	Changshu Xiangying Special Fiber Co., Ltd.
	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
	Zinc oxide polyester fiber	Bilic-Fortune Technology Co,. Ltd.

应用领域	推荐纤维品种	企业
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
婴儿服	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
/ 亲肤 / 抑菌 /	银、锌双复合抑菌聚乳酸纤维	上海德福伦纤维有限公司
	海藻纤维	青岛源海新材料有限公司
	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
西装	循环再利用聚丙烯腈纤维	一
/ 垂感挺括 /		一
/ 平滑抗皱 /	原液着色 PE/PP 皮芯复合纤维 高仿真丝聚酯纤维	用昆集团浙江恒腾差别化纤维有限公司 相昆集团浙江恒腾差别化纤维有限公司
	同川共丝系钼灯华	中纺院绿色纤维股份公司
牛仔	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
/有弹性/耐磨/		
/ 吸湿 /	牛仔用高弹性氨纶	杭州邦联氨纶股份有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司
工装	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
/强度高/耐磨/	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
/抗静电/	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司
		上海安凸阻燃纤维有限公司
	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
	ANT 31/13/13/14/14	山东英利实业有限公司
	循环再利用再生纤维素纤维	唐山三友集团兴达化纤有限公司
	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
	循环再利用氨纶	浙江华峰氨纶股份有限公司
贴身内衣	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司
	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
/ 亲肤 / 柔软 / / 吸湿 /	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
/ P/X/MZ /	海藻纤维	青岛源海新材料有限公司
	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	氧化锌聚酯纤维	博富科技股份有限公司
	低纤度石墨烯改性聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	细旦原液着色聚酰胺 6 纤维	福建凯邦锦纶科技有限公司
	植物基原液着色再生纤维素纤维	宜宾惠美纤维新材料股份有限公司
	仿棉原液着色聚乳酸纤维	嘉兴昌新差别化纤维科技有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
		山东英利实业有限公司
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司
	循环再利用聚酰胺 6 纤维	广东新会美达锦纶股份有限公司
		长乐恒申合纤科技有限公司
<b>袜子</b>	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
	循环再利用氨纶	浙江华峰氨纶股份有限公司
	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司
/ 柔软弹性 / / 吸湿 / 抑菌 /	<b>锌系抑菌聚酯纤维</b>	厦门翔鹭化纤股份有限公司
/ 水池 / 沖插 /	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	氧化锌聚酯纤维	博富科技股份有限公司
	低纤度石墨烯改性聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	生物基 PHBV-PLA 复合纤维	宁波禾素纤维有限公司
	细旦原液着色聚酰胺 6 纤维	福建凯邦锦纶科技有限公司
	植物基原液着色再生纤维素纤维	宜宾惠美纤维新材料股份有限公司
	原液着色聚丙烯腈纤维	河北吉藁化纤有限责任公司

#### 服装用纺织品 CLOTHING TEXTILES

Application field	Recommended fiber	Company
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
Baby clothes	New-solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
Skin	Zinc Antibacterial PET Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Friendliness/ Anti-bacteria	Bacteriostatic Polylactide Silver–Zinc Composite Fiber	Shanghai Defron Chemical Fiber Co., Ltd.
Aiti-bacteria	Alginate fiber	Qingdao Yuanhai New Material Technology CO. , LTD.
Suit	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
Good	Recycled Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
Drapability/ Structured/	Dope Dyed PE-PP Sheath-core Fiber	Guangdong Modern High-tech Fiber Co., Ltd.
Anti-wrinkle	High-imitated-silk PET Fiber	Tongkun Group Zhejiang Hengteng Differential Chemical Fiber Co., Ltd.
Jeans		China Textile Academy Green Fibre Co., Ltd.
Elastic/ Wear	New-solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
Resistance/ Absorbing Moisture	High-elastic Spandex for Denim	Hangzhou Banglian Spanex Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	Dope Dyed Regenerated Waterproof PET Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
Overalls	Sheath-core Conductive PET Fiber Modified with Carbon Nanotubes	Jiangsu ZJA New Material Co.,Ltd.
High-	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
strength/Wear	Dope Dyed PE-PP Sheath-core Fiber	Guangdong Modern High-tech Fiber Co., Ltd.
Resistance/ Anti-static	Anti-Dripping and Permanent Flame-retardant PA Fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Flame-retardant and High-strength Polyester Industrial Yarn	Shanghai Antu FR Fibers Co., Ltd.  Zhejiang Unifull High-tech Fiber Co., Ltd.
	Cationic Easy-dyeing Porous Fine-denier Polyester	Zhejiang Omidi'nigi'r teerr iser oo, etc. Zhejiang Hengyi Petrochemical Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
		China Textile Academy Green Fibre Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
	Recycled Cellulose Fiber	Tangshan Sanyou Group Xingda Chemical Fibre Co., Ltd.
	Recycled Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
	Recycled Spandex	Zhejiang Huafon Spandex Co., Ltd.
Lingerie	Dope Dyed PA6 Fiber with low Fineness	China Resources Yantai Nylon Co., Ltd.
Soft/	Zinc Antibacterial PET Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Skin Friendliness/	Nano-photocatalytic PA6 Fiber of Anti-bacterial and Deodorant functions	Fujian Jinjiang Technology Co., Ltd.
Absorbing	Alginate fiber	Qingdao Yuanhai New Material Technology CO. , LTD.
Moisture	Cationic Easy-dyeing Porous Fine-denier Polyester	Zhejiang Hengyi Petrochemical Co., Ltd.
	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
	Zinc oxide polyester fiber	Bilic-Fortune Technology Co,. Ltd.
	Low- fineness graphene-modified polyamide 6 fiber	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Fine denier dope-coloring polyamide 6 fiber	Fujian Kaibang Nylon Technology Co., Ltd.
	Plant-based dope-coloring regenerated cellulose fiber	Yibin Huimei Fiber New Material Co., Ltd.
	Imitation cotton dope colored polylactic acid fiber	Jiaxing Changxin Differential Fiber Technology Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
		Shandong Yingli Industrial Co., Ltd.
	Recycled Cationic Modified PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Recycled PA6 Fiber	Guangdong Xinhui Meida Nylon Co., Ltd.
	B 114 1151	Changle Hengshen Hexian Technology Co.,Ltd.
Sock	Recycled Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
SULK	Recycled Spandex  Recycled Spandex	Zhejiang Huafon Spandex Co., Ltd.
Soft/	Dope Dyed PA6 Fiber with low Fineness  Zinc Antibacterial PET Fiber	China Resources Yantai Nylon Co., Ltd.  Yiamen Yianglu Chemical Fiber Co. Ltd.
Absorbing Moisture/	Nano-photocatalytic PAG Fiber of Anti-bacterial and	Xiamen Xianglu Chemical Fiber Co., Ltd.  Fujian Jinjiang Technology Co., Ltd.
Anti-bacteria	Deodorant functions Sustained-release Mosquito Repellent Scented Spandex	
	Sustained-release Mosquito Repellent Scented Spandex  Zinc oxide polyester fiber	LDZ New Aoshen Spandex Co., Ltd.  Bilic-Fortune Technology Co., Ltd.
	Low- fineness graphene-modified polyamide 6 fiber	50 1
	3	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Bio-based PHBV-PLA Composite Fiber  Fine denier dope-coloring polyamide 6 fiber	Ningbo Hesu Fiber Co., Ltd.
	Plant–based dope–coloring regenerated cellulose fiber	Fujian Kaibang Nylon Technology Co., Ltd.  Yibin Huimei Fiber New Material Co., Ltd.
	Dope-coloring polyacrylonitrile fiber	Hebei Jifeng Chemical Fiber Co., Ltd.
	Dope coloring polyaci yionidile fibel	ricocratering orientican riber out, Ett.

应用领域	推荐纤维品种	企业
	聚乳酸纤维	安徽丰原生物材料股份有限公司
		中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
围巾	阳离子改性循环再生聚酯纤维	浙江佳人新材料有限公司
/ 亲肤 / 保暖 /	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
	海藻纤维	青岛源海新材料有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
	循环再利用氨纶	浙江华峰氨纶股份有限公司
鞋材	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
/ 透气 / 耐磨 /	安系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
	1377.77.12 1373 1373 1373 1373 1373 1373 1373 13	浙江尤夫高新纤维股份有限公司
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司
箱包	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
/耐磨/	原	浙江尤夫高新纤维股份有限公司
	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司
泳衣	城	福建锦江科技有限公司
	约木兀惟化抑困除开怀浆肌胶 0 纤维	中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	
		山东英利实业有限公司
	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
衬衣	常压阳离子多孔细旦聚酯纤维	浙江恒逸石化有限公司
/ 抗褶皱 /	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司
/ 亲肤 / 抑菌 /	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
	循环再利用 PET/PBT 双组份弹性复合纤维	盛虹集团江苏国望高科纤维有限公司
	PBT/PET 并列复合弹性纤维	洪泽联合化纤有限公司
	仿棉原液着色聚乳酸纤维	嘉兴昌新差别化纤维科技有限公司
	亲水易染复合聚酯纤维	徐州斯尔克纤维科技股份有限公司
	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
		山东英利实业有限公司
服装里料	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司
/柔软/光滑/	一步法多孔细旦聚酰胺 6 纤维	义乌华鼎锦纶股份有限公司
	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司
	仿棉原液着色聚乳酸纤维	嘉兴昌新差别化纤维科技有限公司
	循环再利用 PET/PBT 双组份弹性复合纤维	盛虹集团江苏国望高科纤维有限公司
	低纤度原液着色聚酰胺 6 纤维	烟台华润锦纶有限公司
	中空异形再生纤维素纤维	山东银鹰化纤有限公司
	一步法多孔细旦聚酰胺 6 纤维	义乌华鼎锦纶股份有限公司
羽绒服	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
/ 保暖 / 轻柔 /	低纤度低熔点聚酰胺 6 纤维	长乐恒申合纤科技有限公司
/ 色彩亮丽 /	低纤度石墨烯改性聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	超细多孔弹性聚酯纤维	宁波泉迪化纤有限公司
	细旦原液着色聚酰胺 6 纤维	福建凯邦锦纶科技有限公司
	细旦多孔原液着色聚酰胺 6 纤维	浙江嘉华特种尼龙有限公司
	天然矿物质添加改性聚酰胺 66 纤维	辽宁银珠化纺集团有限公司
仿皮草服装	仿皮草循环再利用聚酯长丝	苏州春盛环保纤维有限公司
/ 蓬松保暖 /	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
/ 仿真 /	原液着色聚丙烯腈纤维	河北吉藁化纤有限责任公司

#### 服装用纺织品 CLOTHING TEXTILES

Application field	Recommended fiber	Company
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
		China Textile Academy Green Fibre Co., Ltd.
Scarf	New-solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
	New-solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
Skin Friendliness/	Recycled Cationic Modified PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.
Heat	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
Preservation	Recycled Acrylic Fibe	Hebei Eric Fiber Co., Ltd.
	Alginate fiber	Qingdao Yuanhai New Material Technology CO. , LTD.
	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
Shoe	Dope Dyed Regenerated Waterproof PET Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
materials	Regenerated Spandex	Zhejiang Huafon Spandex Co., Ltd.
	Dope Dyed PE-PP Sheath-core Fiber	Guangdong Modern High-tech Fiber Co., Ltd.
Breathable/ Wear	Zinc Antibacterial PET Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Resistance	Nano-photocatalytic PA6 Fiber of Anti-bacterial and Deodorant functions	Fujian Jinjiang Technology Co., Ltd.
	Flame-retardant and High-strength Polyester Industrial Yarn	Zhejiang Unifull High-tech Fiber Co., Ltd.
Luggage	Recycled Cationic Modified PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Dope Dyed Regenerated Waterproof PET Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
Wear Resistance	Dope Dyed PE-PP Sheath-core Fiber	Guangdong Modern High-tech Fiber Co., Ltd.
nesistarice	Flame-retardant and High-strength Polyester Industrial Yarn	Zhejiang Unifull High-tech Fiber Co., Ltd.
0 1 1	Dope Dyed PA6 Fiber with low Fineness	China Resources Yantai Nylon Co., Ltd.
Swimsuit	Nano-photocatalytic PA6 Fiber of Anti-bacterial and Deodorant functions	Fujian Jinjiang Technology Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
	_	Shandong Yingli Industrial Co., Ltd.
Shirt	Nano-photocatalytic PA6 Fiber of Anti-bacterial and Deodorant functions	Fujian Jinjiang Technology Co., Ltd.
	Cationic Easy-dyeing Porous Fine-denier Polyester	Zhejiang Hengyi Petrochemical Co., Ltd.
Anti- wrinkle/Skin	Fine-denier Polyacrylonitrile Filament	Changshu Xiangying Special Fiber Co., Ltd.
Friendliness/	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
Anti-bacteria	Recycled PET / PBT Bicomponent Elastic Composite Fiber	Shenghong Group · Guowang High-tech
	PBT / PET side-by-side composite elastic fiber	Hongze Lianhe Chemical Fiber Co., Ltd.
	Imitation cotton dope colored polylactic acid fiber	Jiaxing Changxin Differential Fiber Technology Co., Ltd.
	Hydrophilic and dyeable composite polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	New-solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
Garment	D. D. I DAOE!	Shandong Yingli Industrial Co., Ltd.
lining	Dope Dyed PA6 Fiber with low Fineness	China Resources Yantai Nylon Co., Ltd.
Soft/Smooth	Multiporous Fine-denier PA6 Fiber using one step method	Yiwu Huading Nylon Co.,Ltd.
	Fine-denier Polyacrylonitrile Filament	Changshu Xiangying Special Fiber Co., Ltd.
	Imitation cotton dope colored polylactic acid fiber	Jiaxing Changxin Differential Fiber Technology Co., Ltd.
	Recycled PET / PBT Bicomponent Elastic Composite Fiber	Shenghong Group · Guowang High-tech
	Dope Dyed PA6 Fiber with low Fineness	China Resources Yantai Nylon Co., Ltd.
	Regenerated Hollow-shaped and Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.
Down jacket	Multiporous Fine-denier PA6 Fiber using one step method	Yiwu Huading Nylon Co.,Ltd.
Heat	Easy-dying Polyimide Fiber	Jiangsu Aoshen New Material Co., Ltd.
Preservation/	Low- fineness, low-melting polyamide 6 fiber	Changle Hengshen Synthetic Fiber Technology Co., Ltd.
Soft/Durable Color	Low- fineness graphene-modified polyamide 6 fiber	Changzhou Highbery New Nano Materials Technology Co., Ltd.
23/01	Superfine elastic polyester multifilament	Ningbo Quan Di Chemical Fiber Co., Ltd.
	Fine denier dope-coloring polyamide 6 fiber	Fujian Kaibang Nylon Technology Co., Ltd.
	Fine denier dope-coloring polyamide 6 multifilament	Zhejiang Jiahua Special Nylon Co., Ltd.
Institute of ferro	Modified polyamide 66 fiber with natural minerals	Liaoning Yinzhu Chemtex Group Co., Ltd.
Imitated fur clothing	Imitation fur recycled polyester filament	Suzhou Chunsheng Environmental Fiber Co., Ltd.
Preservation/	Regenerated Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
High imitation	Dope-coloring polyacrylonitrile fiber	Hebei Jifeng Chemical Fiber Co., Ltd.

应用领域	推荐纤维	企业
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
		中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
	阳离子改性循环再利用聚酯纤维	浙江佳人新材料有限公司
	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
床上寝具	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
/ 抑菌 / 亲肤 /	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
/ 柔软 /	银、锌双复合抑菌聚乳酸纤维	上海德福伦纤维有限公司
	中空异形再生纤维素纤维	山东银鹰化纤有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	超细多孔弹性聚酯纤维	宁波泉迪化纤有限公司
	超细聚乙烯纤维	凯泰特种纤维科技有限公司
	植物基原液着色再生纤维素纤维	宜宾惠美纤维新材料股份有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
		中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
क्ष	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
<b>窗帘</b> / 耐晒 / 隔热 /	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
/ 防透视 /	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	无卤阻燃原液着色聚乳酸纤维	河南省龙都生物科技有限公司
	仿棉原液着色聚乳酸纤维	嘉兴昌新差别化纤维科技有限公司
	仿麻聚酯纤维	桐乡市恒基差别化纤维有限公司
	远红外抑菌硅氮系阻燃再生纤维素纤维	北京赛欧兰阻燃纤维有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
111-4011	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司 上海安凸阻燃纤维有限公司
<b>地毯</b> / 阻燃 / 耐脏 /	地毯用阻燃聚酰胺 6 纤维	浙江四通新材料科技股份有限公司
/ 耐磨 /	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	地毯用循环再利用聚酯纤维	龙福环能科技股份有限公司
	原液着色聚丙烯腈纤维	河北吉藁化纤有限责任公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
		中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
沙发布	循环再利用涤涤复合纤维	江苏恒力化纤股份有限公司
/ 耐磨 / 柔软 /	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
/ 易打理 /	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
	细旦聚丙烯腈长丝	常熟市翔鹰特纤有限公司
	仿麻聚酯纤维	桐乡市恒基差别化纤维有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
填充物	循环再利用聚丙烯腈纤维	河北艾科瑞纤维有限公司
/ 轻质 / 蓬松 /	中空异形再生纤维素纤维	山东银鹰化纤有限公司
/ 阻燃 /	地毯用阻燃聚酰胺 6 纤维	浙江四通新材料科技股份有限公司
	聚乳酸纤维	
	聚 孔 殴 计 理	安徽丰原生物材料股份有限公司 中纺院绿色纤维股份公司
	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
<b>毛巾</b> / 抑菌 / 辛盽 /	<b>辛系加</b> 蘭聚酯纤维	
/ 抑菌 / 亲肤 /	锌系抑菌聚酯纤维 纳米光催化抑菌除异味聚酰胺 6 纤维	厦门翔鹭化纤股份有限公司
	锌系抑菌聚酯纤维 纳米光催化抑菌除异味聚酰胺 6 纤维 中空异形再生纤维素纤维	

#### 家纺用纺织品 HOME TEXTILES

Application Field	Recommended Fiber	Company
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-Solvent Based Regenerated Fine Danier Cellulose Fiber	Baoding Swan Fiber Co., Ltd.
	New-Solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
		Shandong Yingli Industrial Co., Ltd.
	Recycled Cationic Modified Pet Fiber	Zhejiang Jiaren New Materials Co., Ltd.
Bedding	Recycled Acrylic Fiber  Zinc Antibactorial Det Fiber	Hebei Eric Fiber Co., Ltd.
Anti- Bacteria/Skin	Zinc Antibacterial Pet Fiber  Nano-Photocatalytic Pa6 Fiber Of Anti-Bacterial And Deodorant Functions	Xiamen Xianglu Chemical Fiber Co.,Ltd.  Fujian Jinjiang Technology Co., Ltd.
Friendliness/	Bacteriostatic Polylactide Silver–Zinc Composite Fiber	Shanghai Defron Chemical Fiber Co., Ltd.
Soft	Regenerated Hollow-Shaped And Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.
	Anti-Dripping And Permanent Flame-Retardant Pa Fiber	Chtc Sinofiber Wuxi Co., Ltd.
	Easy-Dying Polyimide Fiber	Shanghai Antu Fr Fibers Co., Ltd. Jiangsu Aoshen New Material Co., Ltd.
	Superfine Elastic Polyester Multifilament	Ningbo Quan Di Chemical Fiber Co., Ltd.
	Ultra-Fine Polyethylene Fiber	Kaitai Special Fiber Technology Co., Ltd.
	Plant–Based Dope–Coloring Regenerated Cellulose Fiber	Yibin Huimei Fiber New Material Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
		China Textile Academy Green Fibre Co., Ltd.
	New-Solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
	Dope Dyed Regenerated Waterproof Pet Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
Curtain	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
	Dope Dyed Pe-Pp Sheath-Core Fiber	Guangdong Modern High-Tech Fiber Co., Ltd.
Sun- Proof/Heat	Zinc Antibacterial Pet Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Insulation/	Flame-Retardant And High-Strength Polyester Industrial Yarn	Zhejiang Unifull High-Tech Fiber Co., Ltd.
Anti-	Sustained-Release Mosquito Repellent Scented Spandex	Ldz New Aoshen Spandex Co., Ltd.
Perspective	Halogen–Free Flame Retardant Dope–Dyed Polylactic Acid Fibers	Henan Longdu Biotechnology Co., Ltd.
	Imitation Cotton Dope Colored Polylactic Acid Fiber	Jiaxing Changxin Differential Fiber Technology Co., Ltd.
	Linen-Like Polyester Fiber	Tongxiang Hengji Differential Fiber Co., Ltd.
	Far-Infrared Antibacterial Si-N Flame Retardant Regenerated Cellulose Fiber	Beijing Sol Flame-Retardant Fiber Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
Carpet	Dope Dyed Pe-Pp Sheath-Core Fiber	Guangdong Modern High–Tech Fiber Co., Ltd.
Flame	Anti-Dripping And Permanent Flame-Retardant Pa Fiber	Chtc Sinofiber Wuxi Co., Ltd. Shanghai Antu Fr Fibers Co., Ltd.
Retardant/	Flame-Retardant Pa6 Carpet Fiber	Zhejiang Sitong New Material Technology Co., Ltd.
Dirt- Resistant/	Flame-Retardant And High-Strength Polyester Industrial Yarn	Zhejiang Unifull High-Tech Fiber Co., Ltd.
Wear	Sustained-Release Mosquito Repellent Scented Spandex	Ldz New Aoshen Spandex Co., Ltd.
Resistance	Recycled Polyester Fibers For Carpet	Long Fu Environmental Energy Technology Co., Ltd.
	Dope-Coloring Polyacrylonitrile Fiber	Hebei Jifeng Chemical Fiber Co., Ltd.
	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	New-Solvent Based Regenerated Crosslinked Cellulose Fiber	China Textile Academy Green Fibre Co., Ltd.
		Shandong Yingli Industrial Co., Ltd.
Sofa Fabric	Dope Dyed Regenerated Waterproof Pet Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
Wear	Recycled Polyester Composite Fiber	Jiangsu Hengli Chemical Fiber Co., Ltd.
Resistance/	Dope Dyed Pe-Pp Sheath-Core Fiber	Guangdong Modern High-Tech Fiber Co., Ltd.
Soft/Ease- Care	Zinc Antibacterial Pet Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
	Flame-Retardant And High-Strength Polyester Industrial Yarn Fine-Denier Polyacrylonitrile Filament	Zhejiang Unifull High-Tech Fiber Co., Ltd.
	Linen-Like Polyester Fiber	Changshu Xiangying Special Fiber Co., Ltd.
	Sustained-Release Mosquito Repellent Scented Spandex	Tongxiang Hengji Differential Fiber Co., Ltd.  Ldz New Aoshen Spandex Co., Ltd.
Fille	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
	Regenerated Acrylic Fiber	Hebei Eric Fiber Co., Ltd.
Lightweight/ Fluffy	Regenerated Hollow-Shaped And Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.
/Flame	Flame-Retardant Pa6 Carpet Fiber	Zhejiang Sitong New Material Technology Co., Ltd.
Retardant	Polylactic Acid Fiber	Anhui Fengyuan Biomaterial Shares Co., Ltd.
		China Textile Academy Green Fibre Co., Ltd.
Towel	New-Solvent Based Regenerated Crosslinked Cellulose Fiber	Shandong Yingli Industrial Co., Ltd.
Anti-Bacteria,	Zinc Antibacterial Pet Fiber	Xiamen Xianglu Chemical Fiber Co.,Ltd.
Skin/Skin Friendliness/ Soft	Nano-Photocatalytic Pa6 Fiber Of Anti-Bacterial And Deodorant Functions	Fujian Jinjiang Technology Co., Ltd.
	Regenerated Hollow–Shaped And Profiled Cellulose Fiber	Shandong Yinying Chemical Fiber Co., Ltd.
	Alginate Fiber	Qingdao Yuanhai New Material Technology Co. , Ltd.
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	推荐纤维	企业
四用视线		
<b>汽车内饰</b> / 阻燃 / 耐磨 /	地毯用阻燃聚酰胺 6 纤维	浙江四通新材料科技股份有限公司
	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司
	BELLEVIN TO THE REP. O. O. C. T. C.	上海安凸阻燃纤维有限公司
	阻燃高强聚酰胺 66 纤维	中维化纤股份有限公司
	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
	天然矿物质添加改性聚酰胺 66 纤维	辽宁银珠化纺集团有限公司
	阻燃原液着色聚酰胺 6 纤维	上海安凸阻燃纤维有限公司
	远红外抑菌硅氮系阻燃再生纤维素纤维	北京赛欧兰阻燃纤维有限公司
<b>电池隔膜</b> /超细/ /耐腐蚀/ /轻质/	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司
	超细聚乙烯纤维	凯泰特种纤维科技有限公司
发电叶片	QM4035 高强高模碳纤维	威海拓展纤维有限公司
/ 高强高模 /	SYM40 高强高模碳纤维	中复神鹰碳纤维有限责任公司
体育用品	QM4035 高强高模碳纤维	威海拓展纤维有限公司
件月/7700	SYM40 高强高模碳纤维	中复神鹰碳纤维有限责任公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
	义联至机冷剂法再主纤维系纤维	山东英利实业有限公司
	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司
	锌系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司
医用纺织品	静电纺聚丙烯腈纳米纤维	河南中纤新材料科技有限公司
/ 生物质 /		天津工业大学
/ 抑菌 / / 消味除臭 /	熔喷驻极聚丙烯微纳纤维	天津科技大学
/ / / / / / / / / / / / / / / / / / /	海藻纤维	青岛源海新材料有限公司
	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司
	生物基 PHBV-PLA 复合纤维	宁波禾素纤维有限公司
	银、锌双复合抑菌聚乳酸纤维	上海德福伦纤维有限公司
		愉悦家纺有限公司
	纳米聚丙烯腈纤维	嘉兴富瑞邦新材料科技有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
		保定天鹅新型纤维制造有限公司
卫生纺织品	如旦前/台川/公台工51 年系51 年	中纺院绿色纤维股份公司
/ 抑菌 /	交联型新溶剂法再生纤维素纤维	山东英利实业有限公司
/ 吸湿性强 /	 	福建锦江科技有限公司
	等系抑菌聚酯纤维	厦门翔鹭化纤股份有限公司
	聚乳酸纤维	安徽丰原生物材料股份有限公司
	循环再利用氨纶	浙江华峰氨纶股份有限公司
	原液着色 PE/PP 皮芯复合纤维	广东蒙泰高新纤维股份有限公司
	纳米光催化抑菌除异味聚酰胺 6 纤维	福建锦江科技有限公司
	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司
	生物基 PHBV-PLA 复合纤维	宁波禾素纤维有限公司
	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司 上海安凸阻燃纤维有限公司
ED ED / 1/2 E	阻燃高强聚酰胺 66 纤维	中维化纤股份有限公司
军用纺织品	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
/ 质轻 / 抑菌 / / 阻燃 / 导电 /	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司
/高强/	熔喷驻极聚丙烯微纳纤维	天津工业大学
		天津科技大学
	海藻纤维	青岛源海新材料有限公司
	缓释型芳香驱蚊氨纶	连云港杜钟新奥神氨纶有限公司
	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	碳纳米管添加改性皮芯复合导电聚酯纤维	江苏中杰澳新材料有限公司
	芳砜纶	上海特安纶纤维有限公司
	天然矿物质添加改性聚酰胺 66 纤维	辽宁银珠化纺集团有限公司
	阻燃原液着色聚酰胺 6 纤维	上海安凸阻燃纤维有限公司
	防水原液着色循环再利用聚酯纤维	福建省百川资源再生科技股份有限公司
特种纸	细旦新溶剂法再生纤维素纤维	保定天鹅新型纤维制造有限公司

#### 产业用纺织品 INDUSTRIAL TEXTILES

Application field	Recommended fiber	Company
	Flame-retardant pa6 carpet fiber	Zhejiang sitong new material technology co., Ltd.
	A -1 -1 - 1	Chtc sinofiber wuxi co., Ltd.
	Anti-dripping and permanent flame-retardant pa fiber	Shanghai antu fr fibers co., Ltd.
Automotive interior	Flame-retardant and high-strength pa66 fiber	Sinowin chemical fiber co., Ltd.
flame retardant/	Flame-retardant and high-strength polyester industrial yarn	Zhejiang unifull high-tech fiber co., Ltd.
abrasion resistance	Modified polyamide 66 fiber with natural minerals	Liaoning yinzhu chemtex group co., Ltd.
	Flame retardant dope-coloring polyamide 6 fiber	Shanghai antu flame retardant fiber co., Ltd.
	Far-infrared antibacterial si-n flame retardant regenerated cellulose fiber	Beijing sol flame-retardant fiber co., Ltd.
Battery separator Ultra-fine/corrosion	Polyimide nanofiber aerogel membrane by electrospinning	Jiangxi high-nanofiber s&t co.,Ltd
resistanceLightweight	Ultra-fine polyethylene fiber	Kaitai special fiber technology co., Ltd.
Power generation	Qm4035 high strength and high modulus carbon fiber	Weihai tuozhan fiber co., Ltd.
blade High-strength/High Modulus	Sym40 high strength and high modulus carbon fiber	Zhongfu shenying carbon fiber co., Ltd.
	Qm4035 high strength and high modulus carbon fiber	Weihai tuozhan fiber co., Ltd.
Sporting goods	Sym40 high strength and high modulus carbon fiber	Zhongfu shenying carbon fiber co., Ltd.
	Polylactic acid fiber	Anhui fengyuan biomaterial shares co., Ltd.
		China textile academy green fibre co., Ltd.
	New-solvent based regenerated crosslinked cellulose fiber	Shandong yingli industrial co., Ltd.
	New-solvent based regenerated fine danier cellulose fiber	Baoding swan fiber co., Ltd.
	Zinc antibacterial pet fiber	Xiamen xianglu chemical fiber co.,Ltd.
	Polyimide nanofiber aerogel membrane by electrospinning	Jiangxi high-nanofiber s&t co.,Ltd
Medical supplies	Electrospinning polyacrylonitrile nanofibers	Henan zhongxian new material technology co., Ltd.
biology base/		Tiangong university
bacteriostat/	Melt-blow electret polypropylene nanofibers	Tianjin university of science & technology
Deodorizing function	Alginate fiber	Qingdao yuanhai new material technology co. , Ltd.
	Sheath-core Conductive PET Fiber Modified with Carbon	Jiangsu zja new material co.,Ltd.
	Nanotubes	
	Bio-based phbv-pla composite fiber	Ningbo hesu fiber co., Ltd.
	Bacteriostatic polylactide silver–zinc composite fiber	Shanghai different chemical fiber co., Ltd.
	Polyester nanofiber	Yuyue home textile co., Ltd.
	Polyacrylonitrile nanofiber	Jiaxing furuibang new materials technology co., Ltd.
	Polylactic acid fiber  New-solvent based regenerated fine danier cellulose fiber	Anhui fengyuan biomaterial shares co., Ltd.  Baoding swan fiber co., Ltd.
Sanitary textiles	New-solvent based regenerated fine danier cellulose fiber	
hastovlastat /	New-solvent based regenerated crosslinked cellulose fiber	China textile academy green fibre co., Ltd.
bacteriostat/ Absorbing Moisture	Nano-photocatalytic pa6 fiber of anti-bacterial and deodorant	Shandong yingli industrial co., Ltd.
	functions	Fujian jinjiang technology co., Ltd.
	Zinc antibacterial pet fiber	Xiamen xianglu chemical fiber co.,Ltd.
	Polylactic acid fiber	Anhui fengyuan biomaterial shares co., Ltd.
	Regenerated spandex	Zhejiang huafon spandex co., Ltd.
	Dope dyed pe-pp sheath-core fiber	Guangdong modern high-tech fiber co., Ltd.
	Nano-photocatalytic pa6 fiber of anti-bacterial and deodorant functions	Fujian jinjiang technology co., Ltd.
	Sheath-core Conductive PET Fiber Modified with Carbon Nanotubes	Jiangsu zja new material co.,Ltd.
	Bio-based phbv-pla composite fiber	Ningbo hesu fiber co., Ltd. Chtc sinofiber wuxi co., Ltd.
Military textiles	Anti-dripping and permanent flame-retardant pa fiber	Shanghai antu fr fibers co., Ltd.
	Flame-retardant and high-strength pa66 fiber	Sinowin chemical fiber co., Ltd.
Lightweight/	Flame-retardant and high-strength polyester industrial yarn	Zhejiang unifull high-tech fiber co., Ltd.
Anti-bacteria/ Flame Retardant/	Polyimide nanofiber aerogel membrane by electrospinning	Jiangxi high-nanofiber s&t co.,Ltd
Conductive/High-	Melt-blow electret polypropylene nanofibers	Tiangong university
strength	Alginate fiber	Tianjin university of science & technology  Qingdao yuanhai new material technology co., Ltd.
	Alginate fiber Sustained-release Mosquito Repellent Scented Spandex	Ldz new aoshen spandex co., Ltd.
	Easy-dying polyimide fiber	Jiangsu aoshen new material co., Ltd.
	Polysulfonamide(psa)	Shanghai te anlun fiber co., Ltd.
		Liaoning yinzhu chemtex group co., Ltd.
	Modified polyamide 66 fiber with natural minerals  Flame retardant dope-coloring polyamide 6 fiber	Shanghai antu flame retardant fiber co., Ltd.
		Fujian baichuan resources recycling science & technology
Outside	Dope dyed regenerated waterproof pet fiber	co., Ltd.
Special papers	New-solvent based regenerated fine danier cellulose fiber	Baoding swan fiber co., Ltd.

应用领域	推荐纤维	企业
<b>清洁用品</b> /抑菌/ /吸湿快干/	交联型新溶剂法再生纤维素纤维	中纺院绿色纤维股份公司
		山东英利实业有限公司
	锌系抑菌聚酯纤维	福建锦江科技有限公司
	中空异形再生纤维素纤维	厦门翔鹭化纤股份有限公司
	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司
	静电纺聚丙烯腈纳米纤维	河南中纤新材料科技有限公司
过滤产品	熔喷驻极聚丙烯微纳纤维	天津工业大学
高精度过滤		天津科技大学
	纳米聚酯纤维	愉悦家纺有限公司
	纳米聚丙烯腈纤维	嘉兴富瑞邦新材料科技有限公司
	抗熔滴永久阻燃聚酰胺纤维	恒天中纤纺化无锡有限公司 上海安凸阻燃纤维有限公司
消防用品	阻燃高强聚酰胺 66 纤维	中维化纤股份有限公司
/ 阻燃 / 耐磨 /	阻燃高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
/ 耐高温 /	海藻纤维	青岛源海新材料有限公司
/高强度/	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
	芳砜纶	上海特安纶纤维有限公司
	阻燃原液着色聚酰胺 6 纤维	上海安凸阻燃纤维有限公司
	静电纺聚酰亚胺纳米纤维气凝胶膜	江西先材纳米纤维科技有限公司
	QM4035 高强高模碳纤维	威海拓展纤维有限公司
航空航天	SYM40 高强高模碳纤维	中复神鹰碳纤维有限责任公司
/ 阻燃 / 高强 / / 高模 /	易染聚酰亚胺纤维	江苏奥神新材料股份有限公司
/ IPJ1 <del>X</del> /	海藻纤维	青岛源海新材料有限公司
	高强高模聚酰亚胺纤维	长春高琦聚酰亚胺材料有限公司
压力容器罐	压力容器用 HF30F 碳纤维	江苏恒神股份有限公司
人造草坪	绿化用原液着色无卤阻燃聚酰胺 66 单丝	昆山力泰纤维有限公司

#### 产业用纺织品 INDUSTRIAL TEXTILES

Application field	Recommended fiber	Company
Cleaning supplies bacteriostat/Fast Dying	New-solvent based regenerated crosslinked cellulose fiber	China textile academy green fibre co., Ltd.
		Shandong yingli industrial co., Ltd.
	Zinc antibacterial pet fiber	Xiamen xianglu chemical fiber co.,Ltd.
	Regenerated hollow-shaped and profiled cellulose fiber	Shandong yinying chemical fiber co., Ltd.
	Polyimide nanofiber aerogel membrane by electrospinning	Jiangxi high-nanofiber s&t co.,Ltd
Filtration products	Electrospinning polyacrylonitrile nanofibers	Henan zhongxian new material technology co., Ltd.
riiti attori products		Tiangong university
High-precision	Melt-blow electret polypropylene nanofibers	Tianjin university of science & technology
filtration	Polyester nanofiber	Yuyue home textile co., Ltd.
	Polyacrylonitrile nanofiber	Jiaxing furuibang new materials technology co., Ltd.
	Anti-dripping and permanent flame-retardant pa fiber	Chtc sinofiber wuxi co., Ltd. Shanghai antu fr fibers co., Ltd.
Fire supplies	Flame-retardant and high-strength pa66 fiber	Sinowin chemical fiber co., Ltd.
Flame Retardant/	Flame-retardant and high-strength polyester industrial yarn	Zhejiang unifull high-tech fiber co., Ltd.
Wear Resistance/	Alginate fiber	Qingdao yuanhai new material technology co. , Ltd.
Heat-resistant/High-	Easy-dying polyimide fiber	Jiangsu aoshen new material co., Ltd.
strength	Polysulfonamide(psa)	Shanghai te anlun fiber co., Ltd.
	Flame retardant dope-coloring polyamide 6 fiber	Shanghai antu flame retardant fiber co., Ltd
	Polyimide nanofiber aerogel membrane by electrospinning	Jiangxi high-nanofiber s&t co.,Ltd
Aerospace	Qm4035 high strength and high modulus carbon fiber	Weihai tuozhan fiber co., Ltd.
Flame Retardant/	Sym40 high strength and high modulus carbon fiber	Zhongfu shenying carbon fiber co., Ltd.
High-strength/High	Easy-dying polyimide fiber	Jiangsu aoshen new material co., Ltd.
Modulus	Alginate fiber	Qingdao yuanhai new material technology co. , Ltd.
	High-strength and high modulus polyimide fiber	Changchun gaoqi polyimide materials co., Ltd.
Pressure vessel tank	Hf30f carbon fiber for pressure vessels	Jiangsu hengshen co., Ltd.
Artificial turf	Halogen-free flame-retardant dope-coloring polyamide 66 monofilament for greening	Kunshan litai fiber co., Ltd.



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