

ITMF Awards 2022

Application

TENCEL™ Modal with indigo technology



by LENZING AG

Executive Summary

Lenzing Group launched the innovative 'TENCEL™ Modal with Indigo Color technology' in 2021.

The Indigo Color technology behind this new market offering incorporates indigo pigment directly into TENCEL™ branded modal fibers using a one-step spun-dyeing process. This delivers superior color fastness relative to conventional indigo dyeing whilst using substantially fewer resources. This innovative offering is awarded with the EU Ecolabel, and is designated BioPreferred® by the United States Department of Agriculture (USDA).

These innovative spun-dyed Modal fibers are based on the textile industry's need for more environmental friendly processes and materials.

Based on spun-dyeing technology and the knowledge of the project participants and creators about the traditional denim production process, the fiber helps to reduce the environmental impact of indigo dyed yarns and fabrics significantly.

The conventional indigo yarn dyeing is circumvented and cotton is partly replaced by the wood-based cellulosic modal fiber. Compared with traditional rope-dyed indigo yarns using the Modal with Indigo Color technology saves around 99% of water and electricity, as well as 80% of chemicals and even 100% of heat energy.

In addition, a specially commissioned indigo pigment from dyestuff manufacturer DyStar®, ensures that TENCEL™ Modal with Indigo Color technology are certified with STANDARD 100 by OEKO-TEX®, guaranteeing low levels of aniline.

The fiber and its' use in textile applications were developed in cooperation with partners globally. Application development for denim, home textiles and active wear is further pushed by numerous partners with support by the global Lenzing team.

Description

TENCEL™ Modal with indigo technology is a fiber innovation introduced to the market by Lenzing in 2021.

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The use of spun-dyed Modal Indigo Color fibers has an impact on the dyeing as well as the product design in the textile manufacturing chain. The conventional indigo yarn dyeing is circumvented and cotton is partly replaced by the wood-based cellulosic modal fiber. Compared with traditional rope-dyed indigo yarns using the Modal with Indigo Color technology saves around 99% of water and electricity, as well as 80% of chemicals and even 100% of heat energy.

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The development aimed to establish an alternative to conventional Indigo dyeing based on redox dyeing of yarns and thereby to reduce water consumption and treatment need as well as the chemical and energy consumption linked with it. The fiber is to have a purity level that complies with STANDARD 100 by OEKO-TEX® Class 1, and the resulting textiles must furthermore comply with the rubbing fastness (crocking) and the appearance and quality requirements of the primarily targeted denim sector, with the perspective of application in other product segments such as sportswear, home textiles and carpets.

Especially, reaching STANDARD 100 by OEKO-TEX® Class 1 was a crucial development step, being able to achieve residual aniline is 20 ppm.

While rather resistant to conventional denim bleach techniques such as sodium hypochlorite and peroxide bleach, very good results were obtained by the ecologically friendly ozone and laser beaching.

The resulting fabrics showed significantly better wash and rubbing (dry and wet) fastness than conventional denims. On a scale from 1 (worst) to 5 (best), modal Indigo fabrics received values of 4-5, compared with typically 3-2 in the best case for conventional indigo dyed fabrics.

The development used a special indigo pigment in collaboration with DyStar®. Several trial production runs as well as internal spinning, knitting and weaving trials have been performed at Lenzing. Based on earlier experience at Lenzing in spun-dyed cellulosic fibers, pigment particle size range, fiber titer and dyestuff content were optimized to reach darkest indigo shade possible without affecting the fiber mechanical properties. The resulting shade offers the basis for the making of denim laundry effects in later textile manufacturing steps.

Collaboration with the textile value chain and partners is of high value for any development. The fibers were tested and applications developed with several partners that were also part of the fiber launch program. The partners were selected globally and included Candiani in Italy, Cone Denim in Mexico and Blue Diamond in China among others.

Dye fastness and behavior in different bleaching techniques, and serviceability values in typical textile constructions were tested. Based on this experience, manufacturing solutions for different apparel product types were elaborated

Since its launch, the fiber has been used in various applications. This shows that the textile value chain is not only adapting the new technology for brands and retailers to reach sustainability goals like water and chemical reduction but also to allow for new applications and designs

The fiber allows new consumer applications for indigo dyed yarns and fabrics like active wear and home textiles where indigo crocking has been an obstacle.

This new approach provides the basis for new types of products with an indigo design that does not wash off. Besides being a significant innovation in denim madding and design, it opens the doors for Indigo developments in new fields, where the conventionally dyed products cannot meet fastness requirements such as rubbing resistance. It also provides a solution for partners along the supply chain to reach sustainability goals. This technology also allows tailoring color shade on sufficient demand, which would spare or strongly also the bleaching chemicals and water consumption / treatment and provide further reduction of the ecological impacts.

This fiber versatility can be seen in developments in the home textile sector like toweling and upholstery as well as circular and flat knitting.

Lenzing specialist support partners in the value chain developing new fabrics and applications applying an open innovation process.

Video

[TENCEL™ Modal with Indigo Technology - ANIMATION - YouTube](#)

Biography

Tricia Carey

Director of Global Business Development Denim and Americas
Lenzing AG

Tricia is an advocate for innovation and sustainability in the textile and apparel industry. More than twenty years ago, Tricia joined Courtaulds Fibers NY to develop the business plan for a brand new fiber called TENCEL™. Today, Tricia directs the Global Denim Segment, as well as the Americas Business Development teams, with a special interest in advancing more sustainable apparel development from fiber to consumer use.

Tricia holds a Bachelor's degree in Fashion Merchandising from The Fashion Institute of Technology and certificates in Digital Marketing and Strategy from Cornell University and MIT.

Tricia also serves as Secretary of Accelerating Circularity Project, is a member of the Fashion Impact Fund Advisory Board. She was Vice Chair at Textile Exchange from 2014-2018. In 2020 she was nominated as B2B Content Marketer of the Year by Content Marketing Institute, as well as top 100 Denim Legend by WeAr Magazine. In 2019 Tricia was awarded the RIVET 50, influential denim industry leaders. She has been a speaker at various industry events including United Nations, Transformers, Texworld, Premiere Vision, Wear Conference, and more.

Dr. Mohammad Abu-Rous

Project Manager Fiber Science & Textile Products
Lenzing AG

Mohammad is a project manager at the department for Textile Fiber Research and Product Development at the Global R&D of Lenzing AG, Austria.

He studied Chemical Engineering at the Technical University of Vienna and specialized on polymer technology. He holds a PhD degree in Chemistry from the University of Innsbruck for his doctoral thesis on the internal morphology of cellulosic fibers.

His field of activities at Lenzing includes the development of new fibers and product developments, and the design of praxis-near testing of textile thermos-physiological comfort, hygiene, haptics and surface characterization. He contributed to several patents, and published numerous scientific articles and conference contributions.

Publications include (further information to be accessed [Mohammad ABU-ROUS | Project Manager | Doctor of Chemistry | Lenzing Aktiengesellschaft, Lenzing | Global R&D \(researchgate.net\)](#))

2021: Grundmeier, A.-M.; Abu-Rous, M.; Berner-Dannenmann, N.: Pilot Study on Perspiration Odour with Students as Test Persons; Applied Researches in Technics Technologies and Education 8(3-4):178-183

2019: Abu-Rous, M., Liftingner, E.: THE ROLE OF FIBER MOISTURE MANAGEMENT AND SURFACE PROPERTIES IN BACTERIAL GROWTH AND ODOR DEVELOPMENT ON TEXTILES; Conference: Autex

2018: Abu-Rous, M.; Dabolina, I.; Lapkovska, E.: Fabric physical properties and clothing comfort; IOP Conference Series Materials Science and Engineering 459(1):012028

2018: Abu-Rous, M.; Malengier, B.; Liftinger, E.; Innerlohiger, J.: Handfeel of Single Jersey Fabrics as Assessed by a New Physical Method; Journal of Fashion Technology & Textile Engineering 2018, S4

Lenzing Group

The Lenzing Group stands for ecologically responsible production of specialty fibers made from the renewable raw material wood. As an innovation leader, Lenzing is a partner of global textile and nonwoven manufacturers and drives many new technological developments.

The Lenzing Group's high-quality fibers form the basis for a variety of textile applications ranging from elegant ladies clothing to versatile denims and high-performance sports clothing. Due to their consistent high quality, their level of biodegradability and composability, Lenzing fibers are also highly suitable for hygiene products and agricultural applications.

The business model of the Lenzing Group goes far beyond that of a traditional fiber producer. Together with its customers and partners, Lenzing develops innovative products along the value chain, creating added value for consumers. The Lenzing Group strives for the efficient utilization and processing of all raw materials and offers solutions to help redirect the textile sector towards a closed-loop economy.