ADVERTISEMENT FEATURE SOOCHOW UNIVERSITY

SMOOTHING THE WAY TO NEW TEXTILE SOLUTIONS

Soochow University's textile and clothing engineering programme has expanded its curriculum and research scope to reinvent textile technologies, fashion trends, and clothing standards.

Embroidery created with structurally coloured fibre produced by microfluidic technology.

© Suming Zhang and Prof. Ke-Qin Zhang

The city of Suzhou has a 1,000-year history of silk production, and is renowned as the epicentre of the highly prized fabric. This heritage provides a strong background for Soochow University's unique programme of textile science and engineering.

From its beginnings in 1903 as a sericulture school for girls, the programme has developed into a complete system of teaching and research that encompasses all aspects of the silk and textile industry, from mulberry planting, silkworm breeding, and reeling, to weaving, dyeing, fashion design and fabric performance. As China's only comprehensive programme covering the entire textile production cycle, it has a significant impact on industry.

Textile engineering is a multidisciplinary field. With a focus on the silk industry, researchers at Soochow University are leading the field with their new bioengineering technologies for silk production, digital technology for textile and clothing engineering, new chemicals for dyeing, functional fibre materials, and silk protein-based materials for biomedical uses. "We aim to harness modern technologies to enhance the traditional silk and textile industry," said Zhijuan Pan, dean of the College of Textile and Clothing Engineering of Soochow University.

Producing top-grade textiles

Suzhou silk is renowned for its fine beauty. A team led by Soochow University professor, Shiqing Xu, has applied bioengineering technologies to engineer new varieties of the highest quality.

The team has investigated the molecular structure of silk proteins, the silk gland, and protein metabolism to better understand the material. Based on genomic studies of the domesticated silkworm, they have adopted transgenic technology for genetic manipulation, making silkworms produce fibre with better properties, including enhanced strength, toughness, and ductility. Their genetic molecular design has modified and created new biomass fibre, yielding naturally coloured silk and self-cleaning silk for medical use. Several of these technologies for new varieties, including the naturally coloured silk, have been commercialized.

To ensure silk quality, the college was part of an international panel to formulate the ISO standard for electronic testing of raw silk to identify defects and evaluate uniformity.

Green production of silk and other textiles is also integral to engineering research at Soochow University. In exploring technologies for ecological processing, a team led by Rencheng Tang has developed plant-based flame retardants, with and without phosphorus. Using this finishing agent, textiles such as silk can be made flame resistant and non-toxic. Tang's team has also designed natural bioactive compounds for textile finishing, leading to products with improved hygiene and health applications.

For a team led by Yan Zhao, useful features can be achieved via surface modification of textiles. Using interface control technology, they have developed a superhydrophobic and photocatalytic fabric with long-lasting stability and durability. The material is protected against moist contaminants and dirt penetration. Their hydrophilic, oil-repellent fabric allows for absorption and perspiration capabilities. Their water-based fluorine-free finishing agent offers environmental and bio-friendly option for textile finishing.

Other green technologies developed at Soochow University include natural dyes, and supercritical carbon dioxide dyeing, a water-free process that saves energy resources, and reduces waste.

Through genetic engineering, the silkworm can synthesize and secrete protein material weighing 25% of its body mass, to produce colourful silk.

© Prof. Shiqing XU

Extending textile possibilities

Researchers at the college are keen to explore the diverse possibilities of fabric for other innovations. Renowned textile expert, Ke-Qin Zhang , for instance, is dedicated to materials science research on functional fibres. His team has studied nanofibers from graphene to carbon nanotubes. Inspired by the natural phenomenon of structural colouration, namely, the production of colour by the interaction of light with physical structure of materials, Zhang's team has made structurally coloured fibres using nanospheres. Without the use of dye, the fibres display specific hues upon interaction with light, and do not fade. They have also developed the technology for 3D printing of biomaterials based on silk proteins. Academic-industry partnerships are in place to exploit real-world benefits of these high-tech innovations.

Development of silk protein-based biomedical materials is a focus of the team led by Mingzhong Li. They have revealed potential of these materials in making artificial bones and blood vessels, offering wound protection and tissue repair. Li's colleague, Shenzhou Lu, has studied structures and properties of fibroin, an insoluble protein in silk, leading to hydrogel, porous foam, and materials of other forms that can be used in drug delivery as well as tissue engineering.

Focusing on sericin, another glue-like protein produced by silkworms, Guoqiang Chen's group has developed integrated technologies and instruments for high-efficiency sericin recovery, leading to many products promising for industrial use.

Based on textile and fibre structures, a team led by Jian Fang has developed flexible electronic materials, including those that can be used for biosensing, energy collection and storage. Using these materials, Fang's team aims to develop self-powered wearable devices that can monitor body movement, collecting health information.

All these research achievements are fruits of a solid base supported with multiple interdisciplinary platforms. These include the National Engineering Laboratory for Modern Silk, China's only one in the field of textile engineering, and provincial centres devoted to textile and fashion design, silk engineering, or green dyeing and fabric production.

Soochow University's research strength in textile science and engineering has won a global reputation, enhanced through continued international exchange. The programme has enjoyed a 30-year partnership with Shinshu University in Japan. It has established a joint laboratory for biomedical materials with Tufts University in the United States, and has been the organizer of the China International Silk Conference nine times. Ongoing research partnerships have been established with more than 10 other universities globally. ■

Strong infrastructure and human resources support:

- A national key discipline programme, one of the nation's only three in the field of textile engineering
- **More than 10** research platforms in silk and textile science and engineering, including **four** national-level research or teaching platforms
- A total investment of RMB **123** million, with a **90**-million worth of new instruments installed in the past four years
- **More than 85%** of professors on national committees of the industry, or editorial boards or peer review panels of leading journals

Translating research to industrial growth in the past five years:

- Published **1,000-plus** high-level academic papers
- Undertaken **60-plus** national, **250-plus** provincial and ministerial, and **140-plus** enterprise-entrusted projects
- Attained **36** awards of provincial-level or above, including **three** national second prizes and **six** provincial first prizes
- Awarded **170-plus** invention patents, and had **75** technology transfers
- Incubated **10** tech companies, and established **100-plus** academia-industry collaboration bases
- Established **one** international standard and **10** national standards

Advertiser retains sole responsibility for content