TBIS

Topic of the Speech:

Structure Formation, Theoretical Analysis and Application of a Series of Auxetic Textiles

Professor Zhaoqun Du

College of Textiles
Donghua University
China

Professor Zhaoqun Du is a full Professor and Ph.D. supervisor in College of Textiles, Donghua University, China. Dr. Du obtained his B.S. Degree in Textile Materials and Engineering from Zhongyuan University of Technology in 2001. He obtained his PhD in Textile Materials and Design from College of Textiles, Donghua University in 2006. Then, he was an associate professor in College of Textiles, Donghua University from 2008 and to be a supervisor for both MSc and PhD from 2014; after that, he was a professor from 2014, when he pursued in Development, Characterization and Modelling of Structure and Behavior of Textile Materials, and Design, Formation and Characterization of Functional and Smart Textiles.

He has taught various courses at undergraduate and postgraduate levels including Textile Materials, Physics of Textiles, Quality Analysis of Textile Products, Textile Measurement, Testing Principle of Fiber and Its Products, Nanocomposite Science and Technology. He has over 100 scientific publications, including more than 80 SCI/EI papers. He has been authorized over 100 patents, including New Method to Structure and Properties of Textile Materials, New Structure and Materials for Functional and Smart Textile Products, and Innovative Testers for Behavior of Textile Products. Some of the achievements are awarded by Shanghai Municipal Education Commission and Shanghai Education Development Foundation, Fujian provincial government and China National Textile Industry Association, National Excellent Doctoral Dissertation Nomination Award and Shanghai Excellent Doctoral Dissertation Award.

He has undertaken and completed over 20 projects from National Natural Science Foundation of China, Fok Ying Tung Education Foundation, and Ministry of Education of China, State Commission of Science and Technology for National Defense Industry, the Fundamental Research Funds for the Central Universities, the National Key Research and Development Program of China. By acquiring substantial research funding and obtaining funding support from government funding bodies and industry, he established Comprehensive Handle Evaluation System For Fabrics and Yarns, Theoretical Analysis of Mechanical and Heat/Mass Transferring Behavior of Fiber Assembly, Finite Element Analysis and Simulation of Mechanical Deformation of Textile Products, Characterization and Modeling of Structure and Behavior of Textile Materials, and Design and Characterization of Functional and Smart Textiles, Deformation Mechanism of Textile Materials with Negative Poisson's Ratio.

ABSTRACT SUBMISSION
-FOR INVITED SPEAKER ONLY

Structure Formation, Theoretical Analysis and Application of a Series of Auxetic Textiles

Zhaoqun Du* , Longxin Gu, Yuan Tian and Yiluo Zhou
Shanghai Frontiers Science Center of Advanced Textiles, Donghua University, Shanghai 201620, China
*Presenter's email: duzq@dhu.edu.cn

ABSTRACT (NO MORE THAN 500 WORDS:)

Traditional textiles present a positive Poisson's ratio, which show contraction when stretched and expansion when compressed. However, auxetic textiles, i.e., a negative Poisson's ratio, show expansion when stretched and contraction when compressed. It is attributed to auxetic textiles with special structure design. A series of textiles, including yarns, fabrics and composited were designed to have negative Poisson's ratio effect, including ring-spinning yarns, braiding yarns, quasi-auxetic fabric and full-auxetic fabric, auxetic textile composites were designed and fabricated. Corresponding tensile and compression experiments were conducted to prove negative Poisson's ratio. For special behavior of auxetic textiles, functional and smart textile products were also designed and coated with MXene nanomaterials in electrical-thermal property, pressure sensor, TENG, etc. for their unique properties such as surface and interface effects, macroscopic quantum tunneling effects, quantum size effects, and small size effects. Especially, transitional metal nanomaterials have more beneficial properties including electronic and thermal conductivities, which are more potential for intelligent textiles.

We will present our recent activities on structure formation, theoretical analysis and application of a series of Auxetic textiles, and combination with two-dimensional carbides (MXene) nanomaterials, studying their auxetic effect and wearable applications. Especially, we try to prepare A series of textiles, including yarns, fabrics, composites and its wearable heating, pressuring, and highly sensitive devices. For further characterization, we try to use CHES-FY textile style evaluation system to testify the feasibility and wearability of our functional and smart textiles.