



SEMINAR

Cost Effective Production of Ultra-strong Polymer Fibers from Extended Chains

Speaker: *Prof. Donggang Yao*

Abstract: Gel spinning, or extended-chain spinning, is known as a special process for making high-strength polymer fibers. Its commercial success has mainly been demonstrated for ultrahigh molecular weight polyethylene. Applying gel spinning to other polymers has so far only received very limited success, and the underlying working mechanism for gel spinning still remains largely unknown. After the past decade research conducted at Georgia Tech, it becomes clearer that the so-called ‘gel’ material desired in gel spinning is not indeed a classical gel of elastic properties. The effects between gelation and phase separation must be judiciously controlled to achieve a gel-like material that is highly extendable. With the new knowledge applied to processing, the process economics has been significantly improved and more polymers have been successfully gel-spun into high-strength fibers. In particular, an environmentally benign process – twist-gel spinning process – was invented to enhance the productivity of gel spinning, and the new process was successfully used to make ultra-strong fibers with improved economics. The new process was also successfully applied to several other polymers that cannot be gel spun previously, including polyethylene oxide and polyoxymethylene, to produce ultra-strong polymer fibers.

Biography: *Prof. Donggang Yao* received a BS degree in Precision Instruments from Shanghai Jiao Tong University in 1991 and MS and Ph.D. degrees in Mechanical Engineering from University of Massachusetts Amherst in 1998 and 2001. His ongoing research deals with composites processing, ultra-strong fiber processing, polymer precision molding, constitutive modeling, and process modeling. His work in polymer processing has resulted in about 200 publications in journals and conference proceedings. He was a recipient of the National Science Foundation Career Award in 2003. He served as the Chair for the Textile & Composites Committee of the ASME Manufacturing Division from 2009 to 2011 and the Chair of the Polymer and Soft Materials Committee for the ASME Materials Division from 2014 to 2016. He was an associate editor for ASME Journal of Manufacturing Science & Engineering from 2012 to 2018. He currently serves in editorial/advisory boards of several polymer engineering related journals including Advances in Polymer Technology and Polymer Engineering & Science.



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