

MAE Seminar

Viscoelastic Effects in Glass Fiber Spinning

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Abstract

Draw resonance, a common phenomenon causing undesirable feedback between the winder at the end of the spinning process and the flow near the nozzle resulting in fiber diameter variations, occurs less frequently than that predicted by previous models. Another unexplained phenomenon is why the ultimate tensile strength (UTS) is one to two orders of magnitude higher in glass fibers than in bulk glass. We show that viscoelastic effects can describe understand draw resonance inhibition and the attainment of high UTS in glass fibers. Interestingly, this can happen as a modeling post-processing step of Newtonian model and so the typical one-dimensional model is still valid. We also show glass is not thermo-rheologically simple and present a two-component Jeffrey model that shows some promise in modeling fiber spinning. At the end, a commercial message from NSF will be presented about the CDI solicitation and funding trends.

Biosketch

Bill Schultz received his BSME and MSME from Purdue in 1974 and 1976. He received his PhD in Applied Mathematics from Northwestern in 1982 after spending three years at Owens-Corning Fiberglas. Starting to teach at Rutgers University, he has spent the last two decades in Mechanical Engineering at University of Michigan. For the last year and the upcoming year he is the Program Director in Fluid Dynamics at NSF, Engineering Directorate. More details can be found in <http://www-personal.umich.edu/~schultz/>.

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Refreshments will be provided