Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

An examination of the whipping instability of viscoelastic jets in electrospinning.[1] PRADIPTO BHATTACHARYYA, Dept. of Mechanical Engineering, Massachusetts Institute of Technology, JIAN YU, GREGORY RUTLEDGE, Dept. of Chemical Engineering, Massachusetts Institute of Technology, GARETH MCKINLEY, Dept. of Mechanical Engineering, Massachusetts Institute of Technology — The whipping instability of a viscoelastic jet is examined for a number of different test fluids. The whipping motion of the jet during electrospinning is generally conjectured to initiate the large drawdown required to generate polymeric nanofibers with diameters less than 100 nanometers. The phenomenon plays a dominant role in determining the characteristic strain rate at which a fluid filament is deformed during the drawdown. In order to study the whipping motion, a laser beam is passed through the whipping region such that the beam is intercepted by the jet at intervals of time. We analyze and compare both mechanically-forced and natural (unforced) jets. The beam intersection events are manifested as regular drops in the detector voltage and subsequent analysis of the detector signals combined with high-speed digital videomicroscopy provides information on the periodicity of the jet's motion. It is demonstrated that the dynamics transition from a periodic to more complex behavior depending on the viscoelastic nature of the fluid used.

[1]Institute of Soldier Nanotechnologies, Grant Number DAAD-19-02-D-0002 USARO

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Date submitted: 02 Dec 2006 Electronic form version 1.4