Abstract Submitted
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Viscoelastic Electrospinning Jets: Initial Stresses and Elongational Rheometry[1] TAO HAN, Dept. of Polymer Science, U of Akron, ALEXANDER YARIN, Dept of Mechanical and Industrial Engineering, U of Illinois at Chicago, DARRELL RENEKER, Dept of Polymer Science, U of Akron — A novel method of characterization of longitudinal stresses in electrospinning jets is introduced. The measured initial longitudinal stresses in jets of a 6 wt% aqueous solution of polyethylene oxide (M_w=400 kDa) were of the order of 100 kPa, which is two orders of magnitude larger than in other free viscoelastic jets. This is attributed to strong stretching of polymeric liquids in the transition zone between the Taylor cone and the beginning of the jet, where the stretching rates are 100 to 1000 s^{-1}. The velocity of the fluid along the straight segment was determined from the observed jet diameter combined with the laser Doppler velocimeter data. The tensile stress was measured by creating a lateral displacement, near the beginning of the jet, and observing its propagation along the jet. Combination of the velocity with the stress data provided the information needed to determine the modulus and relaxation time of a polymeric liquid subjected to rapid stretching.

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