Abstract Submitted
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Liquid filament instability due to stretch-induced phase separation in polymer solutions[1] ARKADII ARINSTEIN, Technion - Israel Institute of Technology, VALERY KULICHIKHIN, ALEXANDER MALKIN, Institute of Petrochemical Synthesis, Russian Academy of Sciences, TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY COLLABORATION, INSTITUTE OF PETROCHEMICAL SYNTHESIS, RUSSIAN ACADEMY OF SCIENCES TEAM — The instability in a jet of a viscoelastic semi-dilute entangled polymer solution under high stretching is discussed. Initially, the variation in osmotic pressure can compensate for decrease in the capillary force, and the jet is stable. The further evolution of the polymer solution along the jet results in formation of a filament in the jet center and of a near-surface solvent layer. Such a redistribution of polymer seems like a "phase separation", but it is related to stretching of the jet. The viscous liquid shell demonstrates Raleigh-type instability resulting in the formation of individual droplets on the oriented filament. Experimental observations showed that this separation is starting during few first seconds, and continues of about $10-15$ seconds. The modeling shows that a jet stretching results in a radial gradient in the polymer distribution: the polymer is concentrated in the jet center, whereas the solvent is remaining near the surface. The key point of this model is that a large longitudinal stretching of a polymer network results in its lateral contraction, so a solvent is pressed out of this polymer network because of the decrease in its volume.

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