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Tentative topic of the invited talk

Electro-Elongational Rheology of Polyelectrolytes

Abstract of the invited talk

Electrohydrodynamic phenomena, such as electrospinning, rely on the balance between electrical Maxwell stresses, surface tension, and viscous effects to initiate liquid jetting from a charged drop. The dynamics become more complex when the liquid is a polyelectrolyte (PE) solution, where strong electrostatic interactions between charges and counterions govern polymer conformation and charge transport. Although PE solutions are fundamental to charged liquid processing, their behavior under external electric fields remains poorly understood.

This work investigates the capillary-driven thinning of rigid polyelectrolyte solution threads under an axial electric field, simulating conditions found in charged jetting processes. Using an elongational rheometer, we combine experimental and theoretical analysis to reveal that the applied electric field significantly alters thread-thinning dynamics. The field induces elastic stresses within the thread, which we attribute to dipole alignment of the polyelectrolytes. Furthermore, at high field strengths, a previously unobserved oscillatory instability emerges.

These findings provide fundamental insight into the electrohydrodynamics of rigid polyelectrolytes and establish a framework for the controlled formation of electret-containing fibers for advanced applications.