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Macromolecular engineering of pinching dynamics, extensional rheology and processability VIVEK SHARMA, University of Illinois at Chicago, JELENA DINIC, University of Chicago, LEIDY JIMENEZ, CARINA MARTINEZ, University of Illinois at Chicago — We elucidate the influence of chemical structure on macromolecular hydrodynamics, rheological response, and drop formation/liquid transfer. We contrasting the shear and extensional rheology response of aqueous solutions of semi-flexible 2-hydroxyethyl cellulose (HEC) with solutions of flexible, polyethylene oxide (PEO). We critically analyze the radius evolution data obtained using Dripping-onto-Substrate (DoS) rheometry to argue that the solutions of flexible PEO macromolecules exhibit signatures of underlying coil-stretch transition not observed for the solutions of semi-flexible HEC. We distill out how length, diameter and number of Kuhn segments affects macromolecular dynamics, rheological response and processability, and infer that the ratio of packing length to Kuhn length, a parameter we term as segmental dissymmetry, helps to hone in on the contrast related to flexibility and extensibility, that are determined by chemical structure for macromolecules comparable molecular weight.

Vivek Sharma
University of Illinois at Chicago

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