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Flow-induced scission of macromolecules H. SIM, R. SURESHKUMAR, B. KHOMAMI, Washington University in Saint Louis — Mechanical scission of long chain synthetic and bio- polymers in strong flows is pertinent to applications ranging from genomics to polymer-induced turbulent drag reduction. Experiments generally differentiate between two types of fracture mechanisms in extensional flows depending on whether the polymer experiences a steady (e.g. cross slot flow) or transient (e.g. contraction flow) field. Theories based on "mid-point scission hypothesis" as well as computer simulations using bead-spring models that use ad hoc energy-based criteria have been used to explain experimental observations. We present the results of a study that for the first time couples Brownian Dynamics Simulation (BDS) using bead-rod (Kramers) chains with a novel algorithm for the determination of scission events which themselves are stochastic processes. Flexible lambda-phage DNA is selected as a model molecule. We will discuss effect of molecular weight (MW), flow type and hydrodynamic interactions on chain scission and the MW distribution.

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