

Abstract Submitted
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Opening the Pandora's box to understand flow behavior of polymeric fluids. SHAM RAVINDRANATH, University of Akron, POUYAN BOUKANY, U, YANGYANG WANG, SHI-QING WANG, University of Akron — Structure-property relationship has been explored for decades in the context of flow behavior of entangled polymeric liquids. For a long time, it has been assumed that the structure of an entangled polymer, i.e., the entanglement network would experience smooth changes during flow. Using an effective particle-tracking velocimetric (PTV) method recently developed in our lab [1], we found that the nonlinear flow dynamics are associated with an elastic breakdown of the fluid structure. This cohesive failure does not necessarily occur homogeneously in a macroscopic-scale experiment, making it ambiguous to interpret traditional rheological measurements. The presentation compiles a whole set of PTV observations to elucidate the physical origin of nonlinear flow phenomena in complex fluids such as polymers. [1] *Phys. Rev. Lett.* **96**, 016001 (2006); *ibid.* **96**, 196001; *ibid.* **97**, 187801.

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