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Opening the black-box of entangled polymers in flow: A first time-resolved velocity profile determination upon step shear PRASHANT TAPADIA, SHAM S. RAVINDRANATH, SHI-QING WANG, Department of Polymer Science,The University of Akron — We have recently revealed that entangled polymer solutions undergo a discontinuous bulk flow transition under controlled shear stress due to a chain entanglement-disentanglement transition (EDT) [1]. The implication of such results is far reaching, the least of which is that the assumed *homogeneous* shear would not occur in the stress plateau region, invalidating the previous efforts to explore the constitutive behavior of entangled polymers. The present work [2] applied a particle-tracking velocimetric method developed in our lab and confirmed the inevitable consequence of the EDT: presence of a spatial variation of the shear rate across the sample thickness in a cone-plate shear cell. The explicit velocity profile evolution sheds light onto such common features as shear overshoot during startup shear. [1] Tapadia, P.; Wang, S. Q. *Phys Rev. Lett*, **91**, 198301 (2003); Tapadia, P.; Wang, S. Q. *Macromolecules* **37**, 9083 (2004). [2] Tapadia, P.; Wang, S. Q. *Phys. Rev. Lett.* , in press (2005).

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