Meeting: 1005, Newark, Delaware, SS 7A, Special Session on Frontiers on Complex Fluid Flows: Analytic and Computational Methods

1005-35-66 **David A Edwards*** (edwards@math.udel.edu), Department of Mathematical Sciences, Ewing Hall, Newark, DE 19716-2553. *A spatially nonlocal model for polymer desorption.*

In order to describe diffusion of a penetrant in a polymer entanglement network, one must incorporate nonlocal effects. Most previous models have included nonlocality in time only; however, by exploiting the disparate length scales in such systems, one can model these effects by a partial integrodifferential equation which is nonlocal in space. When considering the case of diffusion near the glass-rubber transition, a moving boundary separates the polymer into two regions, each governed by a different set of PDEs. The desorption of a semi-infinite polymer is studied using singular perturbation methods. Layers arise at the exposed surface, at the moving boundary, and initially. Analytical and phase plane solutions are obtained for the solution, which exhibits physically realistic forms of desorption overshoot. Thus spatially nonlocal models have the potential to replicate experimental systems, and should be considered in concert with other viscoelastic models of polymer-penetrant systems. (Received January 26, 2005)