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Dynamics of polymer solutions and polymer/vesicle mixtures during microchannel flow MICHAEL GRAHAM, SAMARTHA ANEKAL, Univ. of Wisconsin-Madison, JUAN HERNANDEZ-ORTIZ, Universidad Nacional de Colombia, Medellin — Addition of small amounts of long-chain polymers to blood has been found to have dramatic effects on its flow in the microcirculation. To address the mechanisms underlying these phenomena, we use a real-space P^3M method for Stokes flow including Brownian fluctuations to study the dynamics of polymer solutions and polymer/vesicle mixtures in microscale flows. Both a simple slit geometry and a grooved cavity flow are studied and polymer concentrations from ultradilute up to near the overlap concentration are considered. As concentration increases, the hydrodynamic migration effects observed in dilute solution unidirectional flows become less prominent, virtually vanishing as the overlap concentration is approached. In a grooved channel geometry, the groove is almost completely depleted of polymer chains at high Weissenberg number in the dilute limit, but at finite concentration this depletion effect is dramatically reduced. In suspensions of vesicles, the presence of polymer molecules has a substantial effect on the dynamics of pair collisions and on migration of the vesicles from microchannel walls.

Michael Graham
Univ. of Wisconsin-Madison

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