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Strain Localization and Sliding Friction in Physically Associating Networks KENDRA A. ERK, KENNETH R. SHULL, Northwestern University — Experimental evidence, constitutive models, and scaling law arguments are presented for shear-induced strain localization in triblock copolymer gels deformed at reduced rates spanning almost four orders of magnitude. Strain-stiffening behavior proceeded by rapid softening is believed to result from the formation of highly localized regions of deformation in the macromolecular network. This behavior is described by a constitutive model that incorporates the strain energy and relaxation of individual strands in the network. Flow curves predicted from the model are non-monotonic, consistent with the onset of flow instabilities at high shear rates. Connections are established between the stress response of the gel at large strain and traditional sliding friction experiments of gelatin gels on glass. The gel's well-defined network structure and tunable range of relaxation times allow for these gels to be useful model systems for future studies of flow instabilities in physically associating solutions.

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