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Effects of Membrane Material Properties on the Deformation of Elastic Capsules in a Shear Flow[1] KIT YAN CHAN, CHARLES EGGLETON, UMBC — The deformation process of elastic capsules in a simple shear flow is studied numerically using the immersed boundary method to probe the influence of membrane material properties. Membrane models that are representative of linear elastic membrane (Hookean law), strain hardening membrane (Skalak), and strain softening membrane (Mooney-Rivlin, neo-Hookean) and the Evans-Skalak model developed from thermodynamic principles to represent the behavior of a lipid bilayer and a cytoskeletal network, are used to study the effects of membrane material properties on the response of the capsule at various shear rates. Simulation results indicate that both the time to reach steady state and the final steady shape of the capsule are sensitive to the choice of the membrane model and parameter values used. These experimentally measurable quantities may be compared with computations for determining suitable model of a particular capsule of interest, and the associated material properties. Local strain and energy distributions computed also provide additional information that is not easily accessible experimentally.

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