

## Complex Fluids; Properties, models and solutions

Pam Cook\*

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Complex fluids are fluids that are non-Newtonian, that is behave differently than water. Particularly important among these fluids are polymers (melted plastics) and surfactant solutions. Surfactants consist of amphiphilic molecules that self-assemble in solution into various micellar structures (e.g. lamellar sheets, spheres, long flexible wormlike structures) depending on the concentration, temperature, and salinity. Wormlike micellar solutions are important in the petroleum and the body- and health-care products industry. In these solutions the long flexible wormlike structures entangle so that the solutions exhibit viscoelastic properties like polymers; but, in contrast to polymers, the worms can break and reform presenting an additional relaxation mechanism. Experimental observations show distinctive (inhomogeneous) behaviors under deformation for these fluids; for example 'shear banding' in simple shear flows and sudden rupture in extensional forcing.

In this talk a two-species elastic network constitutive model that integrates micro and macro-scale effects and incorporates breaking and reforming of the micelles is described along with its predictions and comparison of those with experimental observations.

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