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Structure and flow properties of micelle-nanoparticle solutions from Molecular Dynamics simulations[1] RADHAKRISHNA SURESHKUMAR, SUBAS DHAKAL, ABHINANDEN SAMBASIVAM, Department of Biomedical and Chemical Engineering, Syracuse University, Syracuse, NY 13244 — In aqueous media, cationic surfactant molecules spontaneously self-assemble into diverse morphologies depending upon temperature, surfactant concentration and solution ionic strength. Spherical, cylindrical and long ($\sim$ microns) flexible wormlike structures with or without branches with distinct rheological properties are observed. Inclusion of nanoparticles (NPs) provides additional means to manipulate structure and create active "nano-fluids" that respond to optical, magnetic or electrical stimuli. We study self-assembly, dynamics and rheology of such fluids using coarse-grained Molecular Dynamics simulations in presence of explicit solvent and salt. Specifically, we will discuss the mechanisms underlying fascinating phenomenology observed experimentally such as the pronounced non-monotonic dependence of the zero shear viscosity on salt/NP concentration, shear-induced structure formation, and isotropic to nematic transitions.

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