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Hydrodynamic Signatures of Nanoparticle at the viscous micellar solution-water interfaces PARISA BAZAZI, HOSSEIN HEJAZI, University of Calgary — Nanoparticles, as emerging materials, are extensively used to stabilize liquid-liquid interfaces in many applications ranging from particle-stabilized emulsions. Structured liquids represent a unique state of matter, where all components are liquids. Conventionally, structured liquids are formed by nanoparticle-surfactant jamming at the oil-water interface where a strong interfacial layer is generated. However, such jamming driven structured liquids lack the multiscale porosity that present in solid hierarchies. In this work, we develop a new approach for the formation of multiscale porous and permeable structured liquids in viscous liquid mediums. We incorporate nanoparticles into spontaneous emulsification systems that results in the formation of a spontaneous bicontinuous system. The generated nano/micro size emulsion droplets at the oil-water interface creates a multiscale porous liquid in liquid configuration. To unravel the role of nanoparticles on inhibiting the plateau Rayleigh instability and formation of liquid columns, we examine the thinning of aqueous liquid filaments in viscous micellar solutions. We find that unlike the breakup of pure water filaments that goes through a number of thinning regimes from viscous (inertia) to viscous-inertia, the breakup of nanoparticle filaments occurs in a single thinning regime. The rapid formation of microemulsions at the oil-water interface increases the viscosity of the oil-water interfacial layer and consequently inhibits the transition of thinning regime from viscous to viscous-inertia.

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