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Structured Liquids with pH-Triggered Reconfigurability CAILI HUANG, University of Massachusetts Amherst, BRETT HELMS, The Molecular Foundry, Lawrence Berkeley National Laboratory, GREGORY SMITH, Neutron Science Directorate, Oak Ridge National Laboratory, THOMAS RUSSELL, University of Massachusetts Amherst — The ability to manipulate the shape of liquids in an external field and trapping these non-equilibrium shapes holds significant promise for the development of bicontinuous fluids, novel encapsulants for delivery systems, or all-liquid separations media. We find that the complementary electrostatic interactions of amine-terminated polydimethylsiloxane (PDMS-NH2) dissolved in a hydrophobic fluid (oil) and carboxlic acid functionalized nanoparticles (NPs) dispersed in water results in the formation of NP-surfactants (NPs with a well-defined number of ligands dynamically attached). The NP-surfactant assemblies are disordered yet dynamic, similar to those seen with NPs, and when the fluids are deformed, more NP-surfactants form at the interface such that, upon release of the deformation field, the NP-surfactants jam at the interface locking-in highly non-equilibrium shapes of the fluids. Such structured liquids can be reconfigured back into their equilibrium spherical shapes remotely using a water-soluble photoacid generator, which is triggered by light to disrupt the dynamic complementarity between the polymers and NPs in their jammed state. We present a detailed analysis of NP-surfactant dynamics as a function of pH.

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