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Nanostructured surfaces and the dynamics of colloidal particles, droplets, and slugs CARLOS COLOSQUI, Stony Brook University, JOEL KOPLIK, Levich Institute and Department of Physics, City College of CUNY, JEFFREY MORRIS, Levich Institute and Department of Chemical Engineering, City College of CUNY, ANTONIO CHECCO, Soft Matter Group, Brookhaven National Laboratory — Nanoscale heterogeneities in physical and/or chemical surface properties can have major consequences in the dynamics of colloidal particles at a liquid-fluid interface or femto/picoliter droplets and slugs on a solid substrate. For example, nanoscale heterogeneities can lead to crossovers from fast exponential to slow logarithmic adsorption of colloidal particles at interfaces or membranes, as well as self-propelled motion of microdroplets and slugs on nanopatterned substrates or capillaries. Theoretical models based on continuum thermodynamics can be extended to describe these phenomena at the colloidal scale, while molecular dynamics simulations can assist by providing critical insights into the coupling between thermal fluctuations, interfacial forces, and hydrodynamics at the nanoscale. This talk will present recent theoretical, numerical, and experimental results that (i) document transitions between different dynamic regimes, and (ii) establish relations between physical parameters and characteristic scales in the dynamics of colloidal particles, microdroplets, and slugs induced by nanoscale surface heterogeneities.

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