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# Microstructure and Rheology of Concentrated Colloidal Suspensions with Varying Nanotribological Interactions

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The shear thickening of dense colloidal suspensions is an active area of research to understand the non-linear flow response relevant to various processing conditions, such as high-speed coating, spraying, printing, pumping, and other industrial applications. Efforts in theoretical models and simulations seek to examine the underlying physical forces acting between particles in the suspension, including nanotribological forces such as lubrication hydrodynamics and frictional contact forces, to predict suspension shear rheology. However, few experimental investigations directly measure the nanotribological forces acting between particles or measure the associated suspension microstructure under flow, despite these being essential for connecting colloidal forces to the measured bulk rheology. Thus, there is a scientific need to perform direct nanotribological and microstructural measurements to resolve the origins of this complex rheological behavior. Such research has technological value for improving the processing of high solid dense suspensions, which is often limited by shear thickening, and commercial products that benefit from the shear thickening behavior, such as door stops and speed bumps and armor movement reactive fabrics. The overarching goal of this thesis is to systematically investigate how the nanotribological interactions affect the microstructure and rheology of concentrated colloidal suspensions.