

Friction and shear thickening: A new paradigm for suspension rheology

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Shear thickening - the increase of viscosity with increasing shear rate - is ubiquitous in the flow of concentrated suspensions of particulates, particularly when the particles are large enough to be non-Brownian. In extreme cases, such thickening can lead to viscosity jumps of many orders of magnitude, potentially disrupting industrial processes and damaging machinery. Until recently, the standard explanation involves the formation of 'hydroclusters' due to the strong hydrodynamic lubrication forces between nearby particles. However, experiments, theory and simulations in the last few years have all but conclusively shown that, in fact, shear thickening is caused by particles being pressed into frictional contact with each other, so that aspects of the flow of high-solid-content dispersions resemble the flow of (dry) granular materials. I will review how this paradigm emerged, and what it means for understanding and controlling a class of materials that are widely encountered in diverse sectors.