

## Interfacial rheology of model particles at liquid interfaces

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Particle-stabilized liquid-liquid composites, including Pickering-Ramsden (PR) emulsions and bijels, have received considerable attention in recent years. The reasons for this are twofold: (1) PR composites are model arrested systems and (2) they have significant potential for applications in foods, personal-care products and catalyst supports.

It has been demonstrated that the role of interfacial particles in stabilizing liquid-liquid composites can be quantified using interfacial rheology [1]. However, the full impact of interfacial rheology on the stability of PR composites remains far from fully understood. For example, equivalent particle-laden interfaces in stable emulsions can appear solid-like under compression [2], but fluid-like under shear. This rich behaviour arises from a complex interplay between liquid-liquid tension and interfacial particles. What is currently lacking is a comprehensive investigation of the interfacial rheology of model colloids at liquid interfaces and how that relates to PR composite stability.

Here, we present our results on the interfacial rheology of model microspheres at liquid-air and liquid-liquid interfaces (Fig. 1(a)). We consider both sterically stabilized PMMA particles and charged-stabilized silica particles, varying the wetting properties of the latter by wet-chemical functionalization. We confirm that particle wettability has a strong effect on interfacial rheology [3]. Moreover, we find that liquid interfaces laden with sterically stabilized rather than charge-stabilized particles have a markedly different mechanical response under both compression and shear (Fig. 1(b)), which we attribute to the interfacial mobility of the individual particles.

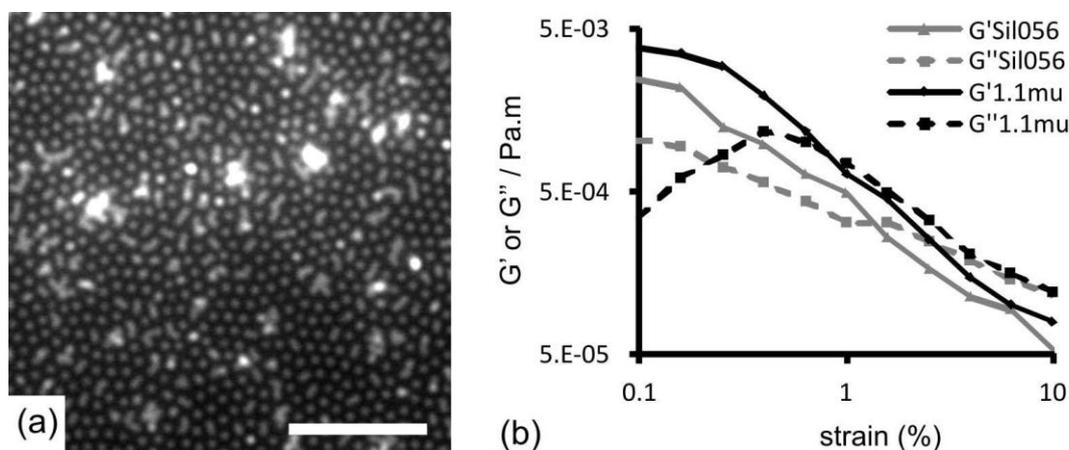


Figure 1: (a) fluorescence micrograph of 1.15  $\mu\text{m}$  diameter particles at a water-oil interface. Colloidal particles are PMMA-PSHA i.e. poly(methyl methacrylate) sterically stabilized with poly(12-hydroxystearic acid); scale bar 25  $\mu\text{m}$ . (b) Oscillatory strain sweeps at an angular frequency of 1 rad/s for 0.58  $\mu\text{m}$  diameter silica spheres at a water-air interface ("SiI056") and 1.15  $\mu\text{m}$  diameter PMMA-PSHA spheres at a water-oil interface ("1.1 $\mu$ ").

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