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Controlled jamming of particle-laden interfaces using a spinning drop tensiometer HSIN-LING CHENG, SACHIN VELANKAR, Chemical Engineering, University of Pittsburgh — Partially-wettable particles often adsorb nearly irreversibly at liquid/liquid interfaces. Under conditions when the interface is crowded with a particle monolayer, "2D jamming" can occur, i.e. the interface loses mobility and displays solid- like characteristics. We studied the jamming of iron oxyhydroxide (FeOOH) particles adsorbed at the interface between ethylene glycol and mineral oil using a spinning drop tensiometer (SDT). With decreasing rotational rate, the cylindrical drop retracted due to interfacial tension, thus reducing the interfacial area and increasing interfacial particle concentration. Accordingly, when the specific interfacial area became comparable to that for a close packing of particles, interfacial jamming occurred and drop retraction was arrested. Fast interfacial contraction or low capillary pressures led to less compact jammed monolayers, i.e. with a larger specific interfacial area. There was also significant hysteresis between compressing vs. expanding the jammed monolayer, suggesting that a certain minimum force is required for unjamming. Limited experiments with the same particles at a mineral oil/ silicone oil interface showed altogether different behavior: a particle-free portion of the interface coexisted with a particle-covered portion, suggesting that the monolayer behavior at this non-polar/non-polar interface is dominated by interparticle attraction.

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