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Spontaneous spreading of particle monolayers from unstable Pickering emulsions HSIN-LING CHENG, SACHIN VELANKAR, Chemical Engineering, University of Pittsburgh — Partially-wettable particles can adsorb at liquid/liquid interfaces and give stable Pickering emulsions. However, if there are insufficient particles, then the emulsion is unstable. In such an unstable emulsion, we document a remarkable phenomenon, viz. coalescence of an oil/water/particle Pickering emulsion contained in a vial induces a particle film to climb up the walls of the vial. While this has been noted previously with nanoparticles, we show that such film-climbing is highly general and can be induced by a variety of particle types, particle sizes ranging from a few nm to a few microns, and different emulsion types. Many of the features of film growth described previously with nm-sized particles are found to remain true even with the far larger particles studied here. Binks et al., Langmuir, 22, 4100, 2006, have postulated that the particle films that climb up the walls of a vial are actually comprised of one oil layer and one water layer, with particles adsorbed at the interface between them. We confirmed this "sandwich" structure experimentally and also show that such interfacially-adsorbed particles can easily exert the very modest surface pressure necessary to sustain the weight of the film. Finally, while some climbing films are tightly-packed particle monolayers, tight packing is not essential; even sparsely-populated monolayers can display film climbing.

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