Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Soft particles as emulsion stabilizers HADI MEHRABIAN, Massachusetts's Institute of Technology , JACCO H. SNOEIJER, University of Twente, JENS HARTING, Helmholtz-Institute Erlangen-Nuremberg — Efficiency of soft particles to stabilize emulsions is examined by measuring their desorption energy i.e. the energy required to detach the particle form a fluid interface. Microgels as well as generic deformable particles are considered. Soft particles and the interface are modeled using molecular dynamics simulations and the free-energy is calculated using the thermodynamic integration method. It is shown that the softness affects the particle-interface binding in two opposing directions. On the one hand, a soft particle spreads at the interface, removes a larger liquid-liquid contact area, and thus is energetically more favorable than a rigid particle. On the other hand, softness gives the particle an extra degree of freedom to get reshaped instead of deforming the interface, producing a smaller excess interfacial area during the detachment, and hence faces a smaller energy barrier to detach. Eventually, the first effect prevails, and a soft spherical particle attaches stronger than a rigid particle to the fluid interface, although its binding is much weaker than the rigid particle with the same lenticular shape at the interface, suggesting that rigid oblate particles are even more effective stabilizers than soft particles.

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Date submitted: 10 Nov 2016 Electronic form version 1.4