Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Capillary interactions between spherical Janus particles at liquid-liquid interfaces HOSSEIN REZVANTALAB, SHAHAB SHOJAEI-ZADEH, Rutgers, The State University of New Jersey — We study the non-equilibrium behavior of Janus particles at a flat liquid-liquid interface. If the Janus boundary is completely sharp and smooth, no interface deformation occurs due to uniform wetting around the particles. However, if the neighboring particles possess different orientations or are pinned at specified angles, they interact due to the induced deformation at the fluid-fluid interface. The tendency to minimize high energy surface areas of the Janus particle distorts the contact line from a circular shape and results in attracting forces between the particles. We examine the energetic interactions among spherical Janus particles as a function of their separation distance, orientation angle, and their wettabilities. It is found that the extent of interface deformation strongly depends on the difference between the wettabilities of the two hemispherical sides. We show that the interface distortions at the near sides of the two spheres join, under appropriate conditions, to form an interfacial structure resembling a capillary bridge. Our calculation provides a detailed insight into the interface deformation and inter-particle forces that arise between randomly oriented Janus spheres before reaching their equilibrium orientation.

Shahab Shojaei-Zadeh
Rutgers, The State University of New Jersey

Date submitted: 03 Aug 2012 Electronic form version 1.4