Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Non-capillary binding of colloidal particles to liquid interfaces DAVID KAZ, UC Berkeley, RYAN MCGORTY, UC San Fransisco, VINOTHAN MANOHARAN, Harvard University — We observe colloidal polystyrene particles binding reversibly to an oil-water interface through the combination of a repulsive electrostatic force and an attractive van der Waals force. Previously studied interactions of an aqueous colloidal particle and a liquid interface have generally fallen into two categories: 1) electrostatic repulsion indicated by the dependence on salt and 2) capillary adsorption where surface tension brings the particle in contact with both phases and is indicated by practically irreversible binding. With our technique of pushing individual colloidal particles towards a planar oil-water interface and observing their motion in three-dimensions with holographic microscopy we have observed both interactions. However, our observations indicate that under certain conditions the electrostatic repulsion, which is due to repulsive image charges, is weak enough for a particle to experience a van der Waals attraction while strong enough to prevent a particle from penetrating the interface and becoming bound through capillary action. We observe individual particles transition between repulsive and attractive interactions with the interface suggesting that these colloidal particles have a heterogeneous surface charge.

David Kaz
UC Berkeley

Date submitted: 11 Nov 2011 Electronic form version 1.4