Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Surface Tension Mediated Under-Water Adhesion of Rigid Spheres on Soft, Charged Surfaces SHAYANDEV SINHA, SIDDHARTHA DAS, Univ of Maryland-College Park — Understanding the phenomenon of surface-tension-mediated under-water adhesion is necessary for studying a plethora of physiological and technical phenomena, such as the uptake of bacteria or nanoparticle by cells, attachment of virus on bacterial surfaces, biofouling on large ocean vessels and marine devices, etc. This adhesion phenomenon becomes highly non-trivial in case the soft surface where the adhesion occurs is also charged. Here we propose a theory for analyzing such an under-water adhesion of a rigid sphere on a soft, charged surface, represented by a grafted polyelectrolyte layer (PEL). We develop a model based on the minimization of free energy that, in addition to considering the elastic and the surface-tension-mediated adhesion energies, also accounts for the PEL electric double layer (EDL) induced electrostatic energies. We show that in the presence of surface charges, adhesion gets enhanced. This can be explained by the fact that the increase in the elastic energy is better balanced by the lowering of the EDL energy associated with the adhesion process. The entire behaviour is further dictated by the surface tension components that govern the adhesion energy.

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Date submitted: 30 Jul 2015 Electronic form version 1.4