Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Surface Mediated Protein Disaggregation[1] MITHUN RADHAKRISHNA, SANAT K. KUMAR, Columbia University — Preventing protein aggregation is of both biological and industrial importance. Biologically these aggregates are known to cause amyloid type diseases like Alzheimer's and Parkinson's disease. Protein aggregation leads to reduced activity of the enzymes in industrial applications. Inter-protein interactions between the hydrophobic residues of the protein are known to be the major driving force for protein aggregation. In the current paper we show how surface chemistry and curvature can be tuned to mitigate these inter-protein interactions. Our results calculated in the framework of the Hydrophobic–Polar (HP) lattice model show that, inter-protein interactions can be drastically reduced by increasing the surface hydrophobicity to a critical value corresponding to the adsorption transition of the protein. At this value of surface hydrophobicity, proteins lose inter-protein contacts to gain surface contacts and thus the surface helps in reducing the inter-protein interactions. Further, we show that the adsorption of the proteins inside hydrophobic pores of optimal sizes are most efficient both in reducing inter-protein contacts and simultaneously retaining most of the native-contacts due to strong protein-surface interactions coupled with stabilization due to the confinement.

[1]Department of Energy (Grant No DE-FG02-11ER46811)

Mithun Radhakrishna
Columbia University

Date submitted: 15 Nov 2013 Electronic form version 1.4