

CBIMMS Invited Seminar

“Surfactant Adsorption to Solid-Liquid Interfaces: Perturbation by Surface Charge, Concentration, and the Approach of Other Surfaces”

William A. Ducker

Professor of Chemistry, Virginia Polytechnic Institute and State University

304 Davidson Hall, Blacksburg, VA 24061-0212

540-231-2249

wducker@vt.edu

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203 Teer Building

ABSTRACT

Surfactant adsorption is important in a number of technological areas, including stabilization of particles and emulsions. In this seminar I discuss our recent experiments on the adsorption of soluble surfactants to solid-liquid interfaces. In the first section I describe experiments in which we determine the relationship between interfacial charge density and the density and arrangement of surfactants at interfaces. The distribution of charge is seen to be very important in the formation of surface micelles. We have also studied the rate of adsorption of surfactants. Low molecular weight surfactants should diffuse and rearrange rapidly at interfaces, but there is a large number of reports of very long arrangement times: surfactants are frequently reported to take hours to days to adsorb. By performing total reflectance Fourier transform infra-red (ATR-FTIR) spectroscopy on isotopically-labelled surfactants under well controlled conditions, we show that surfactants do indeed adsorb very quickly. The adsorption is complete within about 1 second. In the final part of the talk, we discuss some consequences for colloidal stability of the rapid adsorption and desorption of surfactant from solid-liquid interfaces. We show that significant amounts of surfactant can adsorb or desorb from a particle a collision, and that this adsorption has a large impact on colloidal stability. The measurement of this adsorption is performed indirectly, by the use of a Maxwell relationship.