389f Mechanisms of Competitive Adsorption of Albumin and Sodium Myristate at the Silicon Oxide/Aqueous Interface

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The competitive adsorption of proteins and surfactants has applications to chromatographic systems and biological materials. Adsorption for systems of bovine serum albumin (BSA) and sodium myristate (SM) was investigated with in-situ ATR-IR spectroscopy and ex-situ ellipsometry. The results were used to determine quantitatively the surface densities of the adsorbates at the surface. For a mixture of SM and BSA at 25^{o}C in water, the adsorbed density of BSA is 0.3 mg/m^2, which is much less than the value of 3.1 mg/m^2 for BSA alone. Sodium myristate, some of which is protonated to myristic acid (MA) when adsorbed due to a pH decrease from 9.0 to 8.2, adsorbs to a surface density of 4.0×10^{-6} mol/m^2, which is greater than the value of 1.7×10^{-6} mol/m^2 from a solution of SM alone. Adsorbed SM and MA are removed, or desorbed, when the bulk mixture is replaced with water, with only a slight amount of SM remaining. When placed in contact with a layer of BSA, SM can displace most of the adsorbed protein, even when BSA is present in the bulk solution, with some BSA at 0.3 mg/m^2 remaining adsorbed. ΓAllowing BSA to adsorb to a layer of SM results in $_{BSA}$ = 2.3 mg/m^2, with little displacement of the SM layer. These results indicate that SM can remove some BSA from the surface by displacement, and that some BSA remains adsorbed in patches.