

376g Physically Self-Assembled Monolayers (Psam'S) of Lecithin Lipids at Hydrophilic Silicon Oxide Interfaces

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A new method of making Physically Self-Assembled Monolayers (PSAM'S) on hydrophilic solid surfaces is presented. This method uses a mixture of a nonpolar solvent, such as hexane, and a strong polar solvent, such as ethanol, to dissolve the lipids. We have studied the deposition of two lecithin lipids, dipalmitoylphosphatidylcholine (DPPC) and dilauroylphosphatidylcholine (DLPC). These lipids physically self-assemble, or adsorb, onto hydrophilic silicon oxide/silicon surfaces, when such surfaces are in contact with the lipid solution. The adsorbed layers were probed with ex-situ attenuated total reflection infrared (ATR-IR) spectroscopy, ellipsometry, contact angle measurements, and atomic force microscopy (AFM). The thicknesses of the adsorbed monolayers are about 3 nm for DPPC and 2 nm for DLPC, as determined by ellipsometry and AFM. Smooth and uniform monolayers of controlled surface density are formed. The surface density of adsorbed layers can be comparable to those of close-packed lipid monolayers, as calculated from the ATR and ellipsometry results. Producing control-thickness monolayers have applications in boundary lubrication, biomaterials, sensor technology, and electronics. The method can be used for depositing many biological surfactants or lipids without the need to chemically modify these surfactants to form chemical bonds with the surfaces, as required by the usual chemical SAM'S. The new method has several advantages compared to the Langmuir-Blodgett (LB) method and to the method in which lipids are deposited from aqueous dispersions of vesicles.