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Atomic force microscopy and fluorescence correlation spectroscopy studies of interfacial fluids. S. PATIL, G. MATEI, C. GRABOWSKI, P. HOFFMANN, A. MUKHOPADHYAY, Department of Physics, Wayne State University — We have studied the dynamic structure of thin ($\sim$ few nm) liquid films of a nearly spherical, nonpolar molecule tetrakis(2-ethylhexoxy)silane by using a combination of atomic force microscopy (AFM) and fluorescence correlation spectroscopy (FCS). Ultra-sensitive interferometer-based AFM was used to determine the stiffness (force gradient) and the damping coefficient of the liquid film. The experiments show oscillations in the damping coefficient with a period of $\sim$ 1 nm, which is consistent with the molecular dimension as well as previous x-ray reflectivity measurements. However, it fails to detect any stiffness oscillation, indicating that molecules are layered weakly near the solid-liquid interface. Additionally, we performed FCS experiments for direct determination of the molecular dynamics within the liquid film. From the fluctuation autocorrelation curve, we measure the translational diffusion of the probe molecule. The autocorrelation function cannot be fitted with a single diffusion coefficient indicating that the dynamics may vary in different layers.

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