Molecular motion in alkylsilane self-assembled monolayers

DER-RICK STEVENS, North Carolina State University (NCSU), MARY SCOTT, LAURA GUY, JASON BOCHINSKI, LAURA CLARKE, NCSU — We have investigated intra-molecular rotation within polar-substituted alkylsilane self-assembled monolayers (SAMs) on fused silica, utilizing surface-sensitive dielectric spectroscopy. Both trichlorosilanes (which allow crosslinking within the SAM) and monochlorosilanes (attached only to the surface) are utilized to grow monolayer and submonolayer films. Dielectric loss spectra as a function of temperature have been obtained for SAMs with varying carbon chain length, surface coverage, and alkyl terminal group. As shown by ellipsometry, contact angle measurements, and AFM, monochlorosilanes form a more disordered monolayer than trichlorosilanes. This more disordered film may result in additional degrees of freedom within the monolayer, or in the language of phase transitions, a rotator phase. Issues such as uncontrolled vertical polymerization and film growth by island formation and their effect on rotational dynamics will be discussed.

1Funded by NSF Grant 0403871