

Faculty application talks by Dr.Kushal Bagchi

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Talk 1: Probing molecular packing at buried glassy interfaces.

Molecular glasses play an important role in pharmacology, nanolithography, and organic electronics. For organic electronic applications, thin films of molecular glasses are deposited using physical vapor deposition (PVD). Contrary to their liquid-cooled counterparts, PVD glasses can exhibit anisotropic structure. The surface equilibration mechanism successfully predicts several aspects of the bulk structure of PVD glasses but its applicability at buried interfaces remains untested. The structure at the buried interface of glasses has remained unexplored principally because interfacial amorphous structure is challenging to access experimentally. We present here a study of the buried interfaces of two glassy organic semiconductors, Alq3 (Tris-(8-hydroxyquinoline) aluminum) and DSA-Ph (1,4-di-[4-(N,N-diphenyl)amino]styryl benzene). To amplify the fraction of materials at the buried interface we grow superlattices of Alq3 and DSA-Ph and compare it to thick bilayers. We show that the surface equilibration mechanism also determines structure at buried interfaces. Our work outlines a method to explore buried glassy interfaces using spectroscopic ellipsometry and X-ray scattering. We discuss future opportunities for using optical and vibrational spectroscopy on organic superlattices to elucidate interfacial structure in functional soft materials.