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Interpenetration of thin polymer layers: effects of crosslinking and molecular weight THOMAS A SEERY, Univ of Connecticut - Storrs, DAVID SCHWARZLE, OSWALD PRUCKER, JURGEN RUEHE, Universitat Freiburg - IMTEK - CPI, MARK DADMUN, University of Tennessee, Department of Chemistry — Schuh et al have recently reported on a general procedure for preparing robust multilayered polymer structures using C-H bond insertion reactions. Crosslinks formed in these processes can determine the interpenetration of subsequent layers. This molecular phenomenon impacts adhesion and interfacial sharpness. Designed polymer multilayers were prepared from sequential steps of spincoating followed by thermal or photochemical crosslinking steps. We have prepared thin multilayer films containing pendant benzophenones with layers that are alternately hydrophilic or hydrophobic where sharp interfaces are expected due to unfavorable enthalpic interactions between layers. These layered structures are compared to multilayers formed from d-PMMA and h-PMMA. Measurements of interfacial broadening before and after crosslinking for low and high molecular weights indicates that crosslinking does not prevent diffusion across the interface for lower molecular weights and that mobility is strongly molecular weight dependent. Film robustness was demonstrated as films could be removed by simply spinning the wafer with solvent prior to UV exposure. After UV exposure, multiple attempts to remove the layers in this manner were unsuccessful. Neutron reflectivity experiments were performed at NIST and ORNL.

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