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Structural phase transitions and time-resolved dynamics of solid-supported interfacial methanol observed by reflection electron diffraction[1] DING-SHYUE YANG, XING HE, CHENGYI WU, Univ of Houston — Due to their large scattering cross sections with matter, electrons are suitable for contactless probing of solid-supported surface assemblies, especially in a reflection geometry. Direct visualization of assembly structures through electron diffraction further enables studies of ultrafast structural dynamics through the pump-probe scheme as well as discoveries of hidden phase changes in equilibrium that have been obscure in spectroscopic measurements. In this presentation, we report our first observation of unique two-stage transformations of interfacial methanol on smooth hydrophobic surfaces. The finding may reconcile the inconsistent previous reports of the crystallization temperature using various indirect methods. Dynamically, energy transfer across a solid-molecule interface following photoexcitation of the substrate is found to be highly dependent on the structure of interfacial methanol. If it is only 2-dimensionally ordered, as the film thickness increases, a prolonged time in the decrease of diffraction intensity is seen, signifying an inefficient vibrational coupling in the surface normal direction. Implications of the dynamics results and an outlook of interfacial studies using time-resolved and averaged electron diffraction will be discussed.

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