

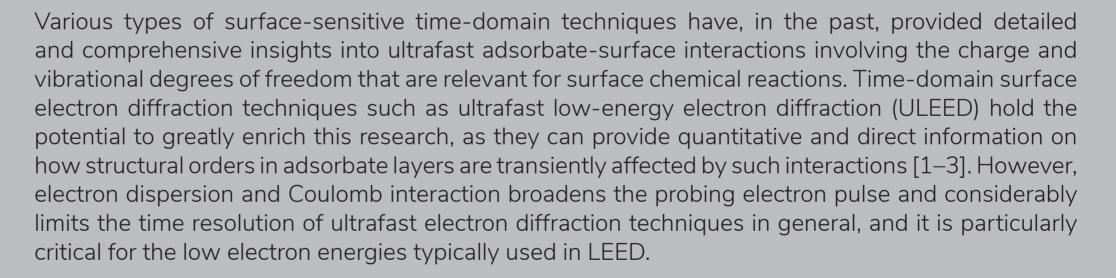
Physical Colloquium

"Ultrafast Low-Energy Photoelectron Diffraction for the Study of Surface-Adsorbate Interactions with 100-fs Temporal Resolution"

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In this talk, I will present a surface-sensitive and ultrafast electron diffraction experiment capable of probing structural dynamics in adsorbate layers with a temporal resolution of 100 fs. In our experiment we analyze the energy-momentum distribution of low-energy photoelectrons excited by a near ultraviolet (NUV) ultrafast laser pulse in graphite that are diffracted as they pass through an ordered tin-phthalocyanine (SnPc) adsorbate layer. We experimentally demonstrate a time resolution of this ultrafast low energy photoelectron diffraction (ULEPD) technique of 100 fs, yet limited by the pulse width of the NUV laser pulse [4]. The analysis of the transient changes in the photoelectron diffraction intensity from the SnPc overlayer indicates the excitation of the adsorbate layer on a characteristic time scale of several ps. We associate the observed changes to vibrational disorder in adsorbate layer as a result of coupling to the phonon bath in graphite, which is transiently excited during the cooling-down of the photo-excited hot carrier distribution.



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- [2] M. Gulde, et al., Science 345, 200 (2014).
- [3] T. Frigge, et al., Nature 544, 207 (2017).
- [4] H. Erk, et al., Phys. Rev. Lett. 133, 226201 (2024).