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Nanoscale electronic and optical investigations of functionalized graphene¹ OZGUN SUZER, JONGWEON CHO, JOSEPH SMERDON, LI GAO, NATHAN GUISENGER, JEFFREY GUEST, Center for Nanoscale Materials, Argonne National Laboratory, Argonne, IL 60439, USA — A rigorous understanding of light-matter interactions at the nanometer scale is pivotal in the development of nanoscale device applications. Graphene and its functionalized derivatives, due to their unique properties, promise unexpected capabilities as a platform for such devices, which has led to significant interest in graphene-based nano-optical, optoelectronic, and photovoltaic applications. Here, we will describe our efforts to resolve and understand the structural, electronic and optical properties of these systems. We will present a UHV STM study of the structural and electronic properties of C60 molecules deposited on graphene that was grown epitaxially on SiC(0001), which serves as a model system for the study of molecule-surface interactions. Our results indicate reduced coupling of the molecules to the graphene and underlying substrate, compared to those on metallic substrates, suggesting a path for developing molecular-scale electronic and optically active “devices” that are not dominated by the substrate. We will also discuss our efforts to correlate these STM studies with the optical properties of the system using a UHV STM that incorporates confocal optical microscopy and spectroscopy at the tip-sample junction with integrated high-numerical aperture optics.

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osuzer@anl.gov
Center for Nanoscale Materials, Argonne National Laboratory,
Argonne, IL 60439, USA

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