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Modifying carbon surfaces and thin films to tune chemical and optical properties[1]

ANNA ZANIEWSKI, Arizona State University

Diamond and graphene are carbon-based materials with remarkable electronic, chemical and optical properties. In this talk, we present a variety of techniques for surface and thin film modifications which result in tuning the properties of graphene and diamond. The first is UV laser modification of conductive nanocrystalline diamond thin films, which results in localized optical bleaching and reduced electrical conductivity. Second, we will discuss the electroless reduction of solution-based metal ions for nanoparticle deposition on graphene transferred to a variety of substrates. We find that the metal ions are spontaneously reduced on a wide variety of graphene substrates, and the substrates play a large role in graphene chemistry. This substrate dependence affects not only wet chemistry, but also plasma-based material deposition; in this light, we discuss results of plasma enhanced atomic layer deposition (PEALD) of dielectrics on graphene. Future experiments of photochemistry on carbon surfaces will also be discussed.

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