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Electronic and Mechanical Properties of Graphene-Germanium Interfaces Grown by Chemical Vapor Deposition BRIAN KIRALY, Northwestern University , ROBERT JACOBBERGER, University of Wisconsin-Madison, ANDREW MANNIX, GAVIN CAMPBELL, MICHAEL BEDZYK, Northwestern University, MICHAEL ARNOLD, University of Wisconsin-Madison, MARK HERSAM, Northwestern University, NATHAN GUISINGER, Argonne National Laboratory — Epitaxial graphene grown directly on semiconducting Ge wafers holds potential for fundamental science and electronics applications. However, since the initial demonstration, little work has been done on the structural and electronic properties of this system. To gain insight into the interface between graphene and Ge, we performed ultra-high vacuum scanning tunneling microscopy (STM) and scanning tunneling spectroscopy (STS) along with Raman and X-ray photoelectron spectroscopy experiments to probe the atomic structure and chemistry at the interface. STS confirms stronger interfacial interaction on Ge(110), consistent with models of epitaxial growth. Raman spectroscopy shows that strain is highly prevalent after growth. Furthermore, the native strain modifies the atomic structure of the Germanium, inducing new and metastable Ge surface reconstructions following annealing. These reconstructions, in turn, modify both the electronic and mechanical properties of the graphene. Finally, graphene/Ge(001) represents the extremely strained case. Here graphene forces restructuring of the Ge surface into [107] facets. From this work, we see that the interaction between graphene and Ge is both dependent on the substrate crystallographic orientation and tunable.

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