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Interface Science in Graphene Materials: An Electronic Structure View of Soft X-Ray Spectroscopy LIANG ZHANG, JUNFA ZHU, University of Science and Technology of China, WEI-CHENG WANG, CHINGLIN CHANG, Tamkang University, PER-ANDERS GLANS, JINGHUA GUO, Lawrence Berkeley National Laboratory — The ability to control the morphology of nanostructured carbon-based materials is of crucial importance for the applications of photovoltaic, energy storage such as Li-ion batteries, etc. The properties of matter at nanoscale dimensions are dramatically different from the bulk. The differences arise through quantum confinement, altered thermodynamics or changed chemical reactivity. In general, electronic structure ultimately determines the properties of matter, thus understanding of electronic structure is crucial for tailoring the properties of nanoscale systems. The graphene/Cu and SiO_2 composites have been studied using XAS, XES and RIXS. New electronic states in the conduction band are observed, which are ascribed to the monovacancy defect state and interfacial interaction. The polarized XAS spectra demonstrate that the graphene/Cu exhibits high alignment and weak corrugation. Significant intensity modulation of resonant XES spectral shape upon different excitation energies near the C K-edge, indicates that graphene preserves an intrinsic symmetry and the interaction between graphene and Cu has unique influence on the electronic structure of graphene. The broad RIXS features and subtle shifts are observed in the RIXS spectra of graphene/Cu, which can be attributed to the strong electron-phonon scattering, charge transfer from the Cu sites

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