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Functionalization of Graphene via Atmospheric Pressure Plasma Jet.[1] WEIXIN HUANG, University of Notre Dame — Graphene, the two-dimensional sp^2 -hybridized carbon, has received significant attention due to its unusual physical and chemical properties. Its zero band gap, however, weakens the competitive strength of graphene to achieve semiconducting behavior. Functionalization of graphene that deforms the band structure of graphene can result in a metal-semiconductor transition. We report our investigations on functionalization of single layer graphene using an atmospheric pressure plasma jet (APPJ) that can generate a variety of reactive plasma species at near-room temperatures. An APPJ was ignited in He and used for treatment of monolayer graphene surfaces. These surfaces were analyzed by ultra-high vacuum X-ray photoelectron spectroscopy (XPS). The obtained C 1s XPS spectra allowed identification of formed surfaces species (C-OH, C-O-C, C=O, and COOH) and demonstrated that the growth rate of a specific oxygen species depends on exposure time of plasma treatment. Plasma-treated graphene films containing more than 40% oxygen content were obtained in the atmospheric environment.

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