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Atomic Scale Properties of Chemically Doped Graphene

ABHAY PASUPATHY, Columbia University

In monolayer graphene, substitutional doping during growth can be used to alter its electronic properties. We used scanning tunneling microscopy, Raman spectroscopy, x-ray spectroscopy, and first principles calculations to characterize individual nitrogen dopants in monolayer graphene grown on a copper substrate. Individual nitrogen atoms were incorporated as graphitic dopants, and a fraction of the extra electron on each nitrogen atom was delocalized into the graphene lattice. The electronic structure of nitrogen-doped graphene was strongly modified only within a few lattice spacings of the site of the nitrogen dopant. These findings show that chemical doping is a promising route to achieving high-quality graphene films with a large carrier concentration. Ref: L. Zhao et al, *Science* **333**,999 (2011).