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**Electronic Transport in Nitrogen-Doped Graphene Devices Using Hyperthermal Ion Implantation** ADAM FRIEDMAN, CORY CRESS, US Naval Research Laboratory, SCOTT SCHMUCKER, NRC Research Associate, JEREMY ROBINSON, OLAF VAN 'T ERVE, US Naval Research Laboratory — For most published studies, atomic species are chemically bonded to graphene out-of-plane, breaking the sp2 symmetry and producing functionalized graphene that is typically only chemically stable for weeks or less. Contrarily, hyperthermal ion implantation offers a controllable method of producing high-quality substitutionally-doped graphene with N, an n-type dopant that has potential for graphene electronics applications where high carrier concentration, uniform doping, and minimal vacancy defect concentration is desired. We examine the transport properties of monolayer graphene sheets as a function of beam energy and dose, observing a suppressed carrier-concentration-dependent transition from weak to strong localization. For nominally equivalent doses, increased N ion energy results magnetoresistance magnitude increases, which we discuss in the context of dopant concentration and defect formation. We use a model for the temperature dependence of the conductivity that takes into account both temperature activation, due to the formation of a transport gap, and Mott variable-range hopping, due to the formation of defects, to further study the electronic properties of the doped films as a function of dose and N ion energy.

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