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Effects of disorder on the transport properties of chemically derived graphene GOKI EDA, JAMES BALL, YE XIAO, ROBERT MAHER, LESLEY COHEN, THOMAS ANTHOPOULOS, MANISH CHHOWALLA, Imperial College London — Transport properties of chemically derived graphene (CDG) are strongly influenced by the concentration of defects that are introduced during synthesis. We present a comprehensive transport study on a range of CDG films with varying degrees of disorder. The electric properties of CDG were found to be tunable over several orders of magnitude via controlled oxidation and reduction. The structural properties of CDG were monitored by analyzing the defect-related features in the Raman spectra and correlated with transport. The temperature dependence of the resistivity of these samples indicate that the conduction mechanism evolves from tunneling to hopping for strongly disordered samples and to activated transport for weakly disordered samples. Strong disorder causes localization of carriers and field-dependent modulation of hopping conduction. We discuss the temperature- and gate-bias-dependence of the resistivity of weakly disordered samples in terms of scattering dominated by midgap states, as is the case in ion irradiated graphene [2].

[1] G. Eda et al., J. Phys. Chem. C, 113, 15768 (2009).

[2] J.-H. Chen et al. Phys. Rev. Lett. 102, 236805 (2009)

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