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Multi-layer graphene derived from graphite fluoride S.H. CHENG, K. ZOU, A. GUPTA, H.R. GUTIERREZ, P. EKLUND, J.O. SOFO, J. ZHU, Department of Physics, The Pennsylvania State University, F. OKINO, Department of Chemistry, Faculty of Textile Science and Technology, Shinshu University — We produce multi-layer graphene through the reduction of graphene fluoride. Graphite fluoride (CF) is synthesized by reacting F_2 with graphite at 500 - 600^{o}C. We obtain few- layer CF sheets through mechanical exfoliation and characterize their properties with electron diffraction, TEM, AFM, Raman and transport measurements. Electron diffraction spectra of fluorinated few-layer CF show the persistence of six-fold hexagonal symmetry and long-range in-plane crystalline order. Domains of varying thickness in both AFM and TEM measurements suggest an incomplete fluorination. Raman spectra of few-layer CF show the appearance of a D band ($\sim$1350 cm^{-1}) as expected from sp^3 bonding. Few-layer CF sheets are defluorinated in flowing H_2/Ar (10%/90%) at 500 - 600^{o}C. AFM studies of defluorinated CF show a pronounced decrease in roughness and thickness, suggesting the removal of fluorine. Raman spectra of defluorinated CF show a reduced background with an enhanced 2D peak ($\sim$2700 cm^{-1}). We present transport measurements in field effect transistors fabricated from CF and defluorinated sheets and compare with that of pristine graphene and graphene-oxide reduced graphene.

Shih-Ho Cheng
Department of Physics, The Pennsylvania State University

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