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Electrochemical Intercalation of Few-Layer Graphenes: Method and Characterization SHU YANG FRANK ZHAO, Department of Physics, Columbia University, GISELLE A. ELBAZ, Department of Chemistry, Columbia University, DMITRI K. EFETOV, JAYAKANTH RAVICHANDRAN, Department of Physics, Columbia University, YINSHENG GUO, Department of Chemistry, Columbia University, NATALEE RAYMOND, Department of Physics, Columbia University, LOUIS BRUS, XAVIER ROY, Department of Chemistry, Columbia University, PHILIP KIM, Department of Physics, Columbia University — Few layer graphene (FLG) intercalate compounds form a new generation of graphene derivative systems where novel physical phenomena such as superconductivity and magnetism may emerge. Experimental realization of FLG has been limited to the harsh intercalation processes which are often not compatible with mesoscopic device fabrication techniques. We demonstrate the in-situ intercalation and transport measurements of mechanically exfoliated FLGs using alkali metals via electrochemical methods. With suitable passivation methods, we isolate the FLG's contribution to the electrochemical current, and electronically monitor the intercalation reaction in real time, via cyclic voltammetry. We correlate the intercalation signatures from cyclic voltammetry with optical and Raman characteristics of the FLGs. Finally, we characterize the intercalated few-layer graphene compounds by transport measurements down to cryogenic temperatures.

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