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Lithium Intercalation of Single-Layer Graphene / Boron Nitride Heterostructures SHU YANG FRANK ZHAO, Harvard University, GISELLE A. ELBAZ, Columbia University, CYNDIA YU, D. KWABENA BEDIAKO, Harvard University, YINSHENG GUO, Columbia University, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, LOUIS BRUS, XAVIER ROY, Columbia University, PHILIP KIM, Harvard University —
Graphene intercalate compounds form a new generation of graphene derivative systems where novel physical phenomena such as superconductivity and magnetism may emerge. Experimental realization of intercalated few-layer graphenes have been limited by harsh intercalation processes, often incompatible with mesoscopic device fabrication techniques. Using electrochemical methods, we demonstrate lithium intercalation of single and few-layer graphene encapsulated in hexagonal boron nitride (BN), where the BN simultaneously serves as a scaffold for the lithium atoms as well as protects the graphene from parasitic chemical reactions in the electrolyte. In addition, we developed techniques to monitor intercalation electronically. By performing in-situ Raman spectroscopy, we confirmed that the intercalated single layer graphene/BN heterostructure reached a Fermi energy in excess of $1.16eV$, and corresponding Hall measurements showed a density in excess of $7E13cm^{-2}$.

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