Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Atomically-Precise Layer Controlled Synthesis and Characterization of cm-Scale Hexagonal Boron Nitride.[1] W.-H. LIN, Caltech, V.W. BRAR, University of Wisconsin-Madison, D. JARIWALA, M.C. SHERROTT, Caltech, W.-S. TSENG, C.-I WU, National Taiwan University, N.-C. YEH, H.A. ATWATER, Caltech — Hexagonal boron nitride is the most promising two-dimensional insulator for device applications because of its large band gap and low density of charged impurities in addition to being isostructural and isoelectronic with graphene. Here we report the synthesis of h-BN films over cm^2 area on Cu foils via chemical vapor deposition, with layer control from 1 to 20 layers. We have characterized these large-area h-BN films at both atomic and macroscopic scales. Raman and infrared spectroscopy indicate the presence of B-N bonds and reveal a linear dependence of thickness with growth time. X-ray photoelectron spectroscopy provides the film stoichiometry, showing the B/N atom ratio to be 1 for all thicknesses. Atomically resolved STM images of monolayer h-BN films on graphene and Au substrates display both the atomic h-BN honeycomb lattice and a Moiré superlattice between h-BN and graphene. Electrical current transport in Au/h-BN/Au heterostructures indicates that these h-BN films behave like excellent tunnel barriers and also possess a high value of the hard-breakdown field strength. Our large-area h-BN films are therefore structurally, chemically and electronically uniform over cm^2 areas.

[1]Department of Energy DE-FG02- 07ER46405 and DE-SC0001293

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Date submitted: 11 Nov 2016

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