Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Electrochemical characterization of chemical vapor deposition grown few-layer graphene[1] RAJARAM NARAYAN, University of California, San Diego, CA USA, MEHMET KARAKAYA, RAMAKRISHNA PODILA, Department of Physics and Astronomy and Clemson Nanomaterials Center, Clemson University, Clemson, SC USA, PRABHAKAR BANDARU, University of California, San Diego, CA USA, APPARAO RAO, Department of Physics and Astronomy and Clemson Nanomaterials Center, Clemson University, Clemson, SC USA — The intrinsic double-layer capacitance (C_{dl}) of graphene is an important fundamental parameter that has important implications in nano-carbon based energy storage devices. We used cyclic voltammetry to measure the C_{dl} of few-layer graphene (FLG) samples. Considering the fact that the specific C_{dl} of graphitic edge planes exceeds that of basal planes by an order of magnitude, the measured specific C_{dl} may be used to evaluate the relative area fraction of edge planes to that of basal planes. In our case, the specific C_{dl} of FLG grown on Ni foils was found to be $\sim$2-4 μF/cm^2, which is typical of basal plane capacitance, and indicating predominant basal plane coverage in our CVD process. Such samples are amenable to further physical/chemical modifications to create controlled defects which are expected to further enhance C_{dl}. Electrochemical characterization of such ideal geometry in tandem with defects engineering can provide insights into the contribution of graphitic edge planes to charge storage in high surface area carbon electrodes.

[1]Research supported by NSF CMMI Grant 1246800.

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Date submitted: 15 Nov 2013 Electronic form version 1.4