Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Biopolymer-nanocarbon composite electrodes for use as high-energy high–power density electrodes[1] MEHMET KARAKAYA, MARK ROBERTS, MARGARITA ARCILLA-VELEZ, JINGYI ZHU, RAMAKRISHNA PODILA, APPARAO RAO, Clemson University — Supercapacitors (SCs) address our current energy storage and delivery needs by combining the high power, rapid switching, and exceptional cycle life of a capacitor with the high energy density of a battery. Although activated carbon is extensively used as a supercapacitor electrode due to its inexpensive nature, its low specific capacitance (100-120 F/g) fundamentally limits the energy density of SCs. We demonstrate that a nano-carbon based mechanically robust, electrically conducting, free-standing buckypaper electrode modified with an inexpensive biorenewable polymer, viz., lignin increases the electrode's specific capacitance ($\sim$ 600-700 F/g) while maintaining rapid discharge rates. In these systems, the carbon nanomaterials provide the high surface area, electrical conductivity and porosity, while the redox polymers provide a mechanism for charge storage through Faradaic charge transfer. The design of redox polymers and their incorporation into nanomaterial electrodes will be discussed with a focus on enabling high power and high energy density electrodes.

[1]Research supported by US NSF CMMI Grant 1246800.

Deepika Saini
Clemson University

Date submitted: 15 Nov 2013 Electronic form version 1.4