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Redox electrodes comprised of polymer-modified carbon nanomaterials MARK ROBERTS, ROBERT EMMETT, Department of Chemical and Biomolecular Engg., Clemson University, Clemson, SC 29634, MEHMET KARAKAYA, RAMAKRISHNA PODILA, APPARAO RAO, Department of Physics, Clemson University, Clemson, SC 29634, CLEMSON PHYSICS TEAM, CLEMSON CHEMICAL ENGINEERING TEAM — A shift in how we generate and use electricity requires new energy storage materials and systems compatible with hybrid electric transportation and the integration of renewable energy sources. Supercapacitors provide a solution to these needs by combining the high power, rapid switching, and exceptional cycle life of a capacitor with the high energy density of a battery. Our research brings together nanotechnology and materials chemistry to address the limitations of electrode materials. Paper electrodes fabricated with various forms of carbon nanomaterials, such as nanotubes, are modified with redox-polymers to increase the electrode's energy density while maintaining rapid discharge rates. In these systems, the carbon nanomaterials provide the high surface area, electrical conductivity, nanoscale 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.

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