Synthesis and Characterization of Doped Carbon Materials for Supercapacitor Applications

Alam, Ahmad (School: Little Rock Central High School)

Objective: To synthesize the co-doped carbon material to attain high specific capacitance using renewable resources (sodium lignosulfonate) for supercapacitor application. Background: Supercapacitors are being used or can be used to enhance laptops, batteries, handheld devices, buses, and cars. Sodium lignosulfonate is a cheap and renewable carbon Methods: Sodium lignosulfonate was doped with APP in order to create the co-doped carbon sample by microwaving 1g of sodium lignosulfonate and 0.5g of APP for 30 minutes. Cyclic voltammetry (CV) was conducted on the pre-freeze and post-freeze materials, and the voltammograms were used to calculate specific capacitance and analyze electrochemical behavior. Results: When CV was conducted with a basic electrolyte, the pre-freeze sample had a specific capacitance of 87.32 F/g and the post-freeze sample had a specific capacitance of 99.52 F/g. When CV was conducted with an acidic electrolyte, the pre-freeze sample had a specific capacitance of 65.44 F/g and the post-freeze sample had a specific capacitance of 93.08 F/g. Conclusion: A surface area analysis was successfully conducted on the pre-freeze material. The sample showed electrochemical behavior which is ideal for energy application including supercapacitors. A post-freeze sample was synthesized and had a greater specific capacitance than the pre-freeze sample and showed more advanced electrochemical behavior. The next step would be to run surface area analysis of the post-freeze sample.

Awards Won: