Flexible and High-Powered Supercapacitor from Low-Cost and Simple Building Method

Noh, Brayden (School: Auburn High School)

As devices increase in needs for alternative energy source other than batteries, supercapacitors have been in development with advanced materials. The objective of the research was to make a supercapacitor with the chemical and physical characteristics of a high-performing supercapacitor, with the constraints of using novel materials for lower cost and innovate the fabrication method for faster and more affordable supercapacitors. Herein, a flexible symmetric supercapacitor with excellent electrochemical performance was assembled using low-cost activated carbon-deep eutectic solvent solution coated graphite felt as the supercapacitor material. A single supercapacitor with 6 cm^2 areas showed a voltage range between 1.8~2.1 V and delivered capacity of 100 Farads or 17 mAh and an energy density of 13 mWh. The supercapacitor also showed excellent voltage stability when the device was bent, which showed that 80% of the voltage remained at 40 degrees bent without vacuum sealing. The production methodology was broken down to each step, which allowed producing the supercapacitor to be less than 5 minutes and the cost to be 50 cents per cm^2. The supercapacitor can easily compete in the current market, thanks to its advantage of low-cost, flexibility, fast charging, and safe production method.

Awards Won:

Second Award of $1,500