Supercapacitors Based on Carbon Nanotube Composites (#6201)

A method showing Polyacrylonitrile (PAN) films, PAN powder, and PAN/carbon nanotube composites can be stabilized and activated using a chemical approach

Georgia Tech inventors have shown that Polyacrylonitrile (PAN) films, PAN powder, and PAN/carbon nanotube composites can be stabilized and activated using a chemical approach. The activated carbon surface area was as high as 3500 m²/g. This is significantly higher than the surface area of the single graphene layer (2630 m²/g). Achievement of the surface area higher than that of the single graphene layer is attributed to the creation of atomic layer thick carbonaceous fragments. Supercapacitor electrodes have been fabricated from these activated PAN and PAN/CNT composites and tested using an ionic liquid/organic electrolyte system. Specific capacitance values in the range of 200 to 400 F/g and energy density values in the range of 50 – 90 Wh/Kg have been achieved. These specific capacitance and energy density values are substantially higher than those of the current state-of-the-art supercapacitors.

Potential Commercial Applications

- High surface area material for high-density energy storage

Background/Context for This Invention

Supercapacitors, also known as electrochemical and double layer capacitors, store charge on their high surface area electrodes. Supercapacitors have high power density but lower energy density than batteries. High energy density can be achieved in supercapacitors by (i) increasing surface area as charge accumulates at the interface between electrode and electrolyte, (ii) by reducing the pore size and pore size distribution, as specific capacitance is inversely proportional to the distance between pore wall and electrolyte ions, and (iii) by selecting proper electrolyte as pore accessibility depends on electrolyte ion size.

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For more information about this technology, please visit:
https://industry.gatech.edu/technology/supercapacitors-based-carbon-nanotube-composites