Enhanced Capacitance in Carbon-Nanotube Based Electrode Systems for Supercapacitors

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BACKGROUND

Researchers have proposed the use of carbon nanotubes (CNTs) as electrodes in electrochemical capacitors and supercapacitors primarily due to their large surface area, abundance of reaction sites, and the possibility of large-charge storage capacity and capacitance. While possessing superior power densities due to fast charge/discharge capabilities, CNT based capacitors have lower energy densities compared to batteries, making them less competitive for most energy-storage applications. The invention provides an approach that overcomes this disadvantage.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed the methods, materials, and designs for producing electrochemical capacitors based on carbon nanotube electrodes with enhanced capacitance due to the addition of charged defects. Specifically, exposure to argon is used to controllably incorporate extrinsic defects into CNTs and increase the magnitude of both the pseudo-capacitance and double-layer capacitance by as much as 50% and 200% respectively, compared to untreated electrodes. The invention's defect-engineered, carbon-nanotube electrochemical capacitors present the promise of supercapacitors that have high power density and high energy density. Further, the technology is scalable, making it useful for a broad range of energy storage and energy management applications (e.g., dynamic storage in microgrids, hybrid/electric vehicles, and wireless devices).

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,711,296	07/18/2017	2010-167

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OTHER INFORMATION

KEYWORDS

carbon nanotube, CNT, supercapacitor, electrode, energy storage, energy management

CATEGORIZED AS

- **Energy**
  - Other
- **Materials & Chemicals**
  - Nanomaterials
- **Nanotechnology**
  - Materials

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