

# Composite Hybrid Electrode Material Composed of Alumina, Titania, and Carbon Nanotubes

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## Improvement to supercapacitors is necessary to match new technologies

Supercapacitors are a type of electrochemical energy storage system that are often used when rapid charge/discharge cycles (burst power) are desired in comparison to long-term energy storage. As modern technology grows increasingly complex, energy requirements have grown, and continuous research is being conducted to improve supercapacitors.

## New innovation improves efficiencies within supercapacitors

Researchers at the Georgia Institute of Technology have developed a new electrode material comprised of vertically aligned multiwalled-carbon nanotubes (VAMWCNTs) with a thin coating of alumina and titania. The result is of using this novel material is a supercapacitor that can store more energy per unit of voltage, has more efficient charging and discharging, and can maintain performance and reliability over multiple cycles when compared to competitors.

The invention is a new composite electrode material designed for use in supercapacitors. The innovation is composed of a hybrid composite material with a thin coating of alumina and titania. Using this composition of materials allows energy storage systems to have increased energy density, power density, and cycle life.

## Summary Bullets

- The invention is a new composite electrode material designed for use in supercapacitors.
- The innovation is composed of a hybrid composite material with a thin coating of alumina and titania which allows energy storage systems to have increased energy density, power density, and cycle life.
- The new composite hybrid electrode is fit for use in renewable energy systems, consumer electronics, aerospace and defense, and can provide a more efficient solution.

## Solution Advantages

- Increased capacitance - can store more energy & power density
- Decreased resistance - efficient charging/discharging
- Better cycle stability

#### Potential Commercial Applications

- Regenerative braking systems of hybrid or electric vehicles
- Renewable energy systems
- Consumer electronics
- Aerospace and Defense

#### Inventors

- Dr. W. Ready  
Adjunct Professor - Georgia Tech School of Material Science and Engineering

#### IP Status

<p>Patent application has been filed</p>:

#### Publications

[Development of Silicon-Embedded Supercapacitors Utilizing Atomic Layer Deposition and Plasma-Enhanced Chemical Vapor Deposition for Functionalization of Carbon Nanotube Electrodes](#), Journal of Electronic Materials - 2021

#### Images

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