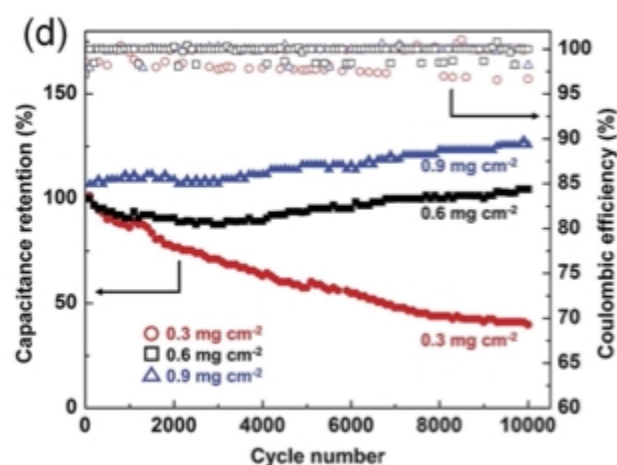


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## PATENT STATUS

Ruthenium Oxide, Nickel  
nanodendrite foam, Supercapacitor,  
Ultracapacitor, Regenerative  
recharge, Electric vehicle, Intermittent  
power source, Energy storage,  
Electrochemical energy storage

- ▶ **Energy**
  - ▶ Storage/Battery
  - ▶ Wind
- ▶ **Materials & Chemicals**
  - ▶ Nanomaterials
- ▶ **Transportation**
  - ▶ Automotive



Capacitance retention and coulombic efficiency at various RuO<sub>2</sub> loading.

ADVANTAGES

The novel aspects of their innovation are:

- ▶ Easily adapted to large scale production.
- ▶ No binders or conductive additives which delivers low equivalent series resistance of 0.5 ohms.
- ▶ Very low processing temperature and the use of environmentally benign chemicals.
- ▶ High energy density and high-power density with superior cycling stability at over 10,000 cycles.

STATE OF DEVELOPMENT

Lab level prototype.

The team fabricated lab level prototypes for performance characterization. Operated at 1.6V the supercapacitors displayed impressive specific capacitance of 678.57 Farads/gram with a high energy density of 60.32 WH/kg. Even at large current density of 100 A/gram, the prototype maintained a high energy density at 19.73 Wh/kg and a high power density of 40 kW/kg. Coulombic efficiencies were greater than 99.5% even after 10,000 cycles.

SUGGESTED USES

- ▶ Super- and Ultra-capacitors
- ▶ Rechargeable energy storage
- ▶ Applications that depend on intermittent renewable energy source such as wind.
- ▶ Regenerative recharge during braking for automotive applications.

RELATED MATERIALS

- ▶ [Scalable, Binderless, and Carbonless Hierarchical Ni Nanodendrite Foam Decorated with Hydrous Ruthenium Dioxide for 1.6 V Symmetric Supercapacitors](#)

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