Carbon Nano Onions: The Ultimate Carbon Black

Brief Overview

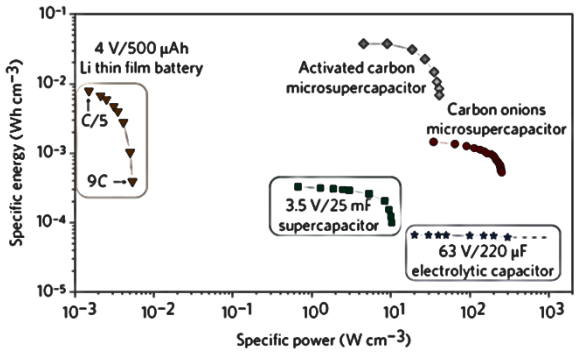
Carbon nano-onions (CNO) have many attractive properties for energy storage, such as high conductivity, high surface area, and exceptionally fast charge-discharge rates. At Drexel University, CNO is synthesized by annealing of a nanodiamond precursor, which can be easily scaled up to kilogram quantities for industrial applications. CNO has gained significant attention in the last five years for energy storage applications, specifically for electrochemical capacitors (ECs). While ECs are ideal for high power applications, CNO ECs show more than 10x the power density of activated carbon, which is the industry standard. The exceptional performance stems from their non-porous structure, allowing ions to adsorb and desorb 1000x faster than activated carbon. We have also shown an increased performance for CNO compared to carbon black as a conductive additive to activated carbon electrodes. Similar performance could be seen for battery electrodes as well.

Applications

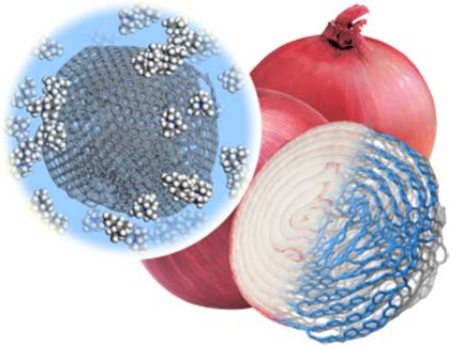
- Electrochemical capacitors
- Lithium ion batteries
- Conductive additive
- Tribology

Advantages

- Up to 1000x faster discharge rate compared to conventional ECs
- 10x higher energy density and comparable power density compared to electrolytic capacitors
- Small particle size allows for better dispersion compared to carbon black



Top: Ragone Plot illustrating the exceptional performance of CNO compared to other traditional energy storage devices. **Bottom:** Schematic of CNO showing layering similar to onions.



Intellectual Property and Development Status

U.S. Utility patent applications in prosecution for composition of matter and applications. Sample materials may be made available under a material transfer agreement.

Drexel Reference IDs: 10-1226D, 10-1231D

DREXEL UNIVERSITY College of Engineering

Commercialization Opportunities

Drexel is currently seeking commercial partners to license and/or sponsor research to further develop this technology.

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Web Site

http://nano.materials.drexel.edu

References

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