

# High Performance Anode Material

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## Technology Summary

Scientists at ORNL have developed a new nano-wire anode material that overcomes the limitations of similar anode materials that have poor capacity retention and/or high production cost. The ORNL material uses a low cost, low temperature, catalyst-free scalable process.

The anode material consists of a vertically-aligned metal-core-shell nano-wire array. The amorphous shell enables high charge capacity, while the metal core functions as a built-in current collector and to enhance the wire strength. This invention offers a distinct advantage in capacity compared to graphite anode used in current Li-ion battery.

Preliminary results show this anode material to have a capacity of over 1000 mAh/g with a significant potential to increase capacity. It also has excellent capacity retention at various charge-discharge rates, including excellent capacity retention for deep charge 2-0.005V and greater than 99% Columbic efficiency after the first cycle. In addition, no fractures, cracks, or delamination were observed in the nano-structures after several charge-discharge cycles.

## Advantages

- Up to ten times the capacity of current graphite anode materials
- Low-cost, low-temperature, catalyst-free scalable process
- Faster charge-discharge rates and faster power release
- Robust structure

## Potential Applications

- Energy storage system
- Photovoltaics
- Thermoelectric devices
- Gas sensors

## Patent

Jun Qu and Sheng Dai, *Composite Nanowire Compositions and Methods of Synthesis*, U.S. Patent Application 12/904,559, filed on October 14, 2010.

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