

Nanotube thermopower: Efforts to store energy in carbon nanotubes described

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When weighing options for energy storage, different factors can be important, such as energy density or power density, depending on the circumstances. Generally batteries -- which store energy by separating chemicals -- are better for delivering lots of energy, while capacitors -- which store energy by separating electrical charges -- are better for delivering lots of power (energy per time). It would be nice, of course, to have both.

Today at the AVS 57th International Symposium & Exhibition, which takes place this week at the Albuquerque Convention Center in New Mexico, Michael Strano and his colleagues at MIT will report on efforts to store energy in thin carbon nanotubes by adding fuel along the length of the tube, chemical energy, which can later be turned into electricity by heating one end of the nanotubes. This thermopower process works as follows: the heat sets up a chain reaction, and a wave of conversion travels down the nanotubes at a speed of about 10 m/s.

"Carbon nanotubes continue to teach us new things -- thermopower waves as a first discovery open a new space of power generation and reactive wave physics," Strano says.

A typical lithium ion battery has a power density of 1 kW/kg. Although the MIT researchers have yet to scale up their nanotube materials, they obtain discharge pulses with power densities around 7 kW/kg.

Strano will also be reporting new results on experiments exploiting

carbon nanopores of unprecedented size, 1.7 nm in diameter and 500 microns long.

"Carbon nanopores," he says, "allow us to trap and detect single molecules and count them one by one," the first time this has been done. And this was at room temperature.

The single molecules under study can move across the nanotubes one at a time in a process called coherence resonance. "This has never been shown before for any inorganic system to date," says Strano, "but it underpins the workings of biological ion channels."

More information: The presentation, "New Concepts in Molecular and Energy Transport Within Carbon Nanotubes: Thermopower Waves and Stochastically Resonant Ion Channels" is at 4:40 p.m. on Tuesday, October 19, 2010. ABSTRACT: www.avssymposium.org/Open/Search/PaperNumber=NS-TuA-9

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