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Nanocomp Develops Carbon Nanotube Textiles For Industrial Applications

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Nanocomp Technologies Inc., Concord, N.H., has produced new nonwoven sheet and yarn textiles from long, continuous carbon nanotubes, with the expectation of using them in such applications as body armor, structural composites, energy storage and electronics thermal management.

According to Nanocomp, the new textiles are 100 times stronger than steel and one-third the weight of aluminum; and efficiently conduct electricity and heat, exhibiting a much faster and more resilient electrical charge capability than batteries. In addition, the long carbon nanotubes, which range in length from hundreds of microns to millimeters and have a high degree of purity, make the materials more functional in end-use applications than the powder-like short carbon nanotubes, measuring tens of microns in length, that have been available commercially up to now.

"One of the key limitations of nanotubes to date, except in some of the more sophisticated electronics applications, is that they've been much too short to take advantage of all the properties that nanotubes showcase," said Peter L. Antoinette, cofounder, president and CEO, Nanocomp. "We're taking a textiles approach to this nanotechnology material rather than a powder approach. Our aim is to create a 21st-century textile with the kind of functionality you see in high-strength or high-conductivity materials. It expands the horizons of what textiles traditionally have been."

Potential applications include: lightweight body armor with improved performance owing to the nanotube materials being used along with carbon fibers and aramids; air, land and marine vehicles with improved fuel economy; wiring systems and antennas; and ultra capacitors for energy storage from wind and solar and other intermittent energy sources, and to mitigate the effects of demand spikes in the power grid.

Antoinette said the company is presently making small amounts of the materials for trials and research. The US Army Natick Soldier Center, Natick, Mass., is assisting with funding for development and production of materials for ballistics testing of body armor; and the US Navy Office of Naval Research, Arlington, Va., is providing funding for materials development and production for both body armor and advanced composites.

The company also is developing prototype automated equipment for commercial-scale production of the yarns and nonwoven sheets.

"We're developing machinery using off-the-shelf products for certain elements such as gas control and alarm systems, but the harvesting and downstream treatments are all our own machine design," Antoinette said. "There will be other elements — for example, when one is making yarn — that will be adaptations of centuries-old technology," he added, describing the nanotubes as "a slippery, tiny staple — not a filament material."

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