Quantum wires to be used as power cables for next-gen spacecraft

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NASA has awarded Rice University's Carbon Nanotechnology Laboratory a four-year, $11 million contract to produce a prototype power cable made entirely of carbon nanotubes.

The project aims to pioneer methods of producing pure nanotube power cables, known as quantum wires, which may conduct electricity up to 10 times better than copper and weigh about one-sixth as much. Such technologies may advance NASA's plans to return humans to the moon and eventually travel to Mars and beyond.

“Technology advances like these are exactly what will be needed to realize the future of space exploration,” Howell said. “We are extremely fortunate to be able to pool the unique expertise available at JSC, Rice and the other collaborators in this effort.”

The contract was awarded by NASA's Exploration Systems Mission Directorate. It calls for an additional $4 million in related research at JSC, where researchers will conduct crucial work in the area of nanotube growth, and at NASA's Glenn Research Center, where nanotube composites will be developed for fuel cell components.

Rice's portion of the funding includes support for collaborative projects at Houston-based Carbon Nanotechnologies Inc., which specializes in large-scale nanotube production; GHG Corp.; Duke University and the University of Pennsylvania.

“In the Space Shuttle, the primary power distribution system accounts for almost 7 percent of the craft's weight,” said Smalley, University Professor, the Gene and Norman Hackerman Professor of Chemistry, professor of physics and the lead researcher on the project.. “To support additional instrumentation and broadband communications, NASA's next generation of human and robotic spacecraft will need far more power. For ships assembled in orbit, a copper power distribution system could wind up accounting for one-quarter the weight of the vessel.”

The contract calls for CNL to provide NASA a one-meter prototype of a quantum wire by 2009. This will require major breakthroughs in the production and processing of nanotubes. Notably, a way has yet to be found to produce a specific type of nanotube. Of the hundreds of types available, only about 2 percent, known as “armchair” nanotubes, are types that conduct electricity well enough for quantum wires.

“We need to find a way to make just the nanotubes we want, and we need them in large quantities,” said CNL Executive Director Howard Schmidt. “Another major focus of the research will be finding new ways to combine armchair nanotubes, which are single molecules just a billionth of a meter wide, into large-scale fibers and wires.”

Source: Rice University