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MATERIALS SCIENCE

ACID ROUTE TO NANOTUBE FIBERS

Concentrated nanotube dispersions could be used to make ultrastrong materials

[BETHANY HALFORD](#)

A sulfuric acid-based superacid makes an excellent medium for dispersing single-walled carbon nanotubes (SWNTs) at concentrations that are useful for industrial processes. This discovery, made by researchers at Rice University, Houston, enabled them to process the dispersion into the first continuous fibers of aligned, pristine SWNTs [*Macromolecules*, published online Dec. 9, <http://dx.doi.org/10.1021/ma0352328>]. Fibers like these might be used to make ultralight, ultrastrong materials with remarkable electronic, thermal, and mechanical properties.

The team, led by assistant professor of chemical engineering [Matteo Pasquali](#) and chemistry and physics professor [Richard E. Smalley](#) found that the acids coat SWNTs with a layer of protons.

This phenomenon allows the team to overcome the tubes' tendency to clump together, and they can make solutions composed of up to 10% SWNTs by weight--10 times more concentrated than any previously prepared dispersions. At these high concentrations, the SWNTs self-align in a liquid-crystalline phase, similar to the polymer used for making Kevlar. More dilute dispersions employ hard-to-remove detergents and polymer additives and are considered impractical for industrial purposes.

"The production of fibers and structures of aligned nanotubes described at the end of the paper is also very exciting," says



SUPERSTRING Pasquali displays a "barely there" length of carbon nanotube fiber.
TOMMY LAVERGNE/RICE UNIVERSITY

nanotube fiber pioneer Philippe Poulin of the CNRS Paul Pascal Research Center in Bordeaux, France. "This extension is a very nice example of how a deep scientific study can lead to technological advances."

Pasquali tells C&EN that the multidisciplinary Rice team was crucial to the work. "It's one more example of 21st-century science, where you have to bring together experts in a number of different fields to see results."

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