Risk review suggests that carbon nanotubes be treated, for now, 'as if' hazardous

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(PhysOrg.com) -- In a new paper published by the Society for Risk Analysis, a UC Berkeley researcher argues for caution when dealing with carbon nanotubes. Because environmental and health information on carbon nanotubes is incomplete and sometimes conflicting, an "anticipatory governance" approach to the technology is needed, says post-doc researcher Mark Philbrick.

While offering great promise in a host of new applications, carbon nanotubes (CNTs) could be harmful to humans and a new risk review suggests that product designers and others should provisionally treat CNTs "as if" they are hazardous.

Carbon nanotubes are extremely small, with a diameter measured in nanometers. A nanometer is one-billionth of a meter, or about one eighty-thousandth the thickness of a human hair. CNTs are very versatile and come in several forms, conferring great strength while also being very light.

Because environmental and health information on CNTs is incomplete and sometimes conflicting, an “anticipatory governance” approach to the technology is needed, according to Mark Philbrick, post-doctoral researcher at the Center of Integrated Nanomechanical Systems at the University of California, Berkeley. Anticipatory governance is an approach designed to support decision makers where there is uncertainty about safety, a common situation when managing emerging technologies.

The research was funded by the National Science Foundation and the conclusions are detailed in Philbrick's article “An Anticipatory Governance Approach to Carbon Nanotubes,” in the November issue of the journal Risk Analysis published by the Society for Risk Analysis. The entire November issue is devoted to risk analysis articles related to nanotechnology.

An anticipatory approach is particularly important until the toxicity and behavior of CNTs in the environment are better understood, especially as they can remain airborne for extended periods, and share some characteristics with asbestos. While a few rodent studies have found similarities between the health effects of inhaling both substances, there is not enough data to draw firm conclusions.

The article notes the promise held out by CNTs is immense: some types conduct electricity and heat better than copper, others are stronger than steel while weighing less than aluminum, and yet others could be used in targeted drug delivery. These properties could find uses in aircraft frames, sensors, and electrical transmission. Nevertheless, treating them “as if” they are hazardous is a prudent course of action given uncertainty about their potential health consequences, the author said.

Given the “conflicted character of the data,” how “relevant actors” should respond is the central question Philbrick asks in developing strategies for utilizing CNTs. He asserts that treating carbon nanotubes “as if” they are hazardous implies limiting exposure throughout product life-cycles. This means implementing strong engineering controls for CNT research and manufacturing, avoiding applications where the CNTs would be routinely released to the environment, and planning for recycling at the end of a product’s useful life. The article also argues that “the anticipatory governance approach is particularly important as innovation rates in nanotechnologies exceed our capacity to assess human and environmental consequences of these innovations, especially

when deployed at commercial scales … it helps identify uncertainties in our knowledge and focuses future research to address those gaps."

More information: Paper: onlinelibrary.wiley.com/doi/10 … 24.2010.01445.x/full

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