UO Lab Solves Another Nanoscience Problem

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Another problem solved: University of Oregon chemists involved in the Oregon Nanoscience and Microtechnologies Institute (ONAMI) are now able to control the spacing between nanoparticles, a key step for the development of a new class of nanoelectronic devices.

An article to be published in Langmuir, the American Chemical Society's surface science journal, details the process developed by UO chemistry professor Jim Hutchison and his students.

"We care about the spacing between the particles because the interactions between them are distance-dependent," Hutchison says. "If they're too far apart, the interaction will be weaker, preventing the particles from passing electrons from one to another."

Hutchison explained this most recent advance, and showed in detail how particles of matter the size of about a single nanometer can be made, functionalized and organized into lines, during the grand opening of the ONAMI center May 27 in Corvallis.

The ability to control spacing of nanoparticles at 1.5 to 3 nanometers is the latest in a series of groundbreaking discoveries coming out of the UO's materials science program. A nanometer is a billionth of a meter. A human hair is about 50,000 nanometers thick.

Already known as the world leader for teaching green chemistry principles, Hutchison's lab is now pioneering the field of "green

nanoscience," helping to shape this emerging area of scientific inquiry. Earlier this month (May 4), the University of Oregon received a patent on Hutchison's breakthrough method for synthesizing nanoparticles using an environmentally benign process. The scientific paper describing the patented process was published in the Journal of the American Chemical Society in 2000.

Hutchison's lab in Eugene can turn out more nanoparticles in a few hours than can be made in a week using the traditional approach. This faster, safer, cheaper way of making functionalized gold nanoparticles has the potential to speed along development of nanotechnology.

Hutchison's process is versatile, rapid and reproducible--the first significant change in the way such material is made in 20 years. As a result, Oregon has a strong claim in what's shaping up to be this century's version of a gold rush. Nanotechnology's potential has been predicted as being a trillion-dollar market by 2015, making it the next industrial revolution, the National Science Foundation says.

In much the same way that candy-coated chocolate drops can be dyed different colors, Hutchison and his students also have learned to optimize or "tune" the properties of nanoparticles so they will dissolve in water or in solvents and exhibit specific reactivity, depending on the need. Such ability to harness the behavior of molecular "building blocks" opens up galaxies of possible applications in areas such as biomedicine, optics and electronics--even cosmetics.

Other achievements by Hutchison and his students include methods for forming well-ordered nanoparticle monolayers and multilayers on insulating surfaces for use in nanoelectronic devices. What's more, they've developed methods for forming one- and two-dimensional nanoparticle structures using DNA as a template.

All of these innovations have involved the application of green chemistry methods pioneered by Hutchison and UO chemistry professor Ken Doxsee. They established the world's first green organic chemistry lab at Oregon in 1997. Green chemistry is rapidly becoming the standard worldwide as industry seeks clean, resource-efficient manufacturing techniques.

Hutchison, 41, joined the UO faculty in 1994. He grew up in Florence, Ore., and graduated from South Salem High School in 1981. He earned a bachelor's degree in chemistry from the UO in 1986 and a doctorate from Stanford in 1991.

The National Science Foundation, the Alfred P. Sloan Foundation and the Camille & Henry Dreyfus Foundation, Inc., fund Hutchison's research.

The University of Oregon is a partner in the Oregon Nanoscience and Microtechnologies Institute (ONAMI), a collaboration involving the UO, Oregon State University, Portland State University, the Pacific Northwest National Laboratory and high-tech private industry that is leveraging the state of Oregon's strengths in nanoscience and microscale engineering. For more information about ONAMI, visit www.onami.us.

For more information about the Hutchison labs, visit www.uoregon.edu/~hutchlab/.

The original news release can be found here