Chemist explores nanotechnology in search of cheaper solar cells

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(Phys.org) -- Luke Hanley is a big believer in harnessing solar energy to produce electricity. Doing it more efficiently is his goal.

"If you could make solar cells cheaper and more efficient, then you could think about putting them on a much wider variety of surfaces," said Hanley, professor and head of chemistry at the University of Illinois at Chicago.

"There's only a certain amount of energy that falls from the sun per square meter. You can't increase that amount of energy, but you can make it less expensive to capture it," he said.

Hanley received a $390,000 grant from the National Science Foundation to test methods of coating solar panel films using nanoparticles from a chemical group called metal chalcogenides. The inexpensive films could be wrapped over everything from vehicles to buildings to gain maximum sunshine exposure and produce electricity.

Chalcogenides are fairly abundant, relatively cheap, and don't contain toxic elements like cadmium or tellurium, which are often used in solar cells.

"Using less expensive, less toxic materials -- and using processes where you could coat inexpensively and not use much of the material -- could make these solar cells more viable," Hanley said.

Working with Igor Bolotin, research assistant professor of chemistry, and graduate students Mike Majeski and Doug Pleticha, Hanley developed a method for depositing metal chalcogenide nanoparticles by cluster beam deposition. The process uses a magnetically confined electrical discharge of argon gas ions to knock metal atoms into the gas phase and react with hydrogen sulfide or hydrogen selenide. The metal-sulfide or metal-selenide then condenses into nano-sized clusters that land on a surface to produce the film.

"If you can do everything from the gaseous deposition stage, you might make the process less expensive," Hanley said. "You also may make a novel material that has a better efficiency."

Hanley and his coworkers will evaluate the electrical properties of these new films and study how they respond to light. He thinks that using different chemicals for nanoparticle-embedded solar films could create new products some two to three times more efficient than products now on the market, making solar energy more competitive.

But Hanley noted there are other factors to consider besides price.

"Fossil fuels will always have an associated environmental cost," he said, while the sun does not.

"So, there's a great long-term interest in solar energy."

Provided by University of Illinois at Chicago