Research finds bright future for alternative energy with greener solar cells

April 9 2012

(Phys.org) -- Even alternative energy technologies can sometimes be a little greener, according to a Kansas State University graduate student's research.

Ayomi Perera, a doctoral student in chemistry, Sri Lanka, is working under Stefan Bossmann, professor of chemistry, to improve dye-sensitized solar cells. The cells are a solar technology that use a dye to help generate energy from sunlight. By creating a less toxic dye and combining it with a bacteria, Perera's solar cells are friendlier to the environment and living organisms -- making an alternative energy solution to fossil fuels even greener.

"Dye-sensitized solar cells, which are solar cells with light-absorbing dye, have been around for more than 20 years, but their highest efficiency has stayed close to 11 percent for some time," Perera said. "So the thought was that rather than trying to increase the efficiency, let's try to make to make the technology more green."

To make the solar cells greener and more efficient, Perera begins with the bacteria Mycobacterium smegmatis. Amycrobacterium is a type of pathogen that can cause diseases such as tuberculosis. Perera is using a species that is completely harmless and can be found in soil and cornflakes. It also produces the protein MspA, which can be used for numerous applications once it has been chemically purified.

After purification, Perera combines the protein with a synthesized dye

that is less toxic than traditional dyes. The protein-dye mixture is coated onto individual solar cells -- which form large solar panels when assembled -- and is then tested with artificial sunlight to measure energy output.

"The idea is that the protein acts as a matrix for electron transfer for this dye that absorbs sunlight," Perera said. "We want the protein to be able to capture the electron that the dye gives out and then transfer that electron in one direction, thereby generating an electrical current."

Although the new dye-sensitized solar cells currently do not improve on the technology's ability to convert sunlight into electrical current, the technology is the first of its kind and could help low-cost solar cells become a more viable option in the alternative energy field.

"This type of research where you have a biodegradable or environmentally friendly component inside a solar cell has not been done before, and the research is still in its early stages right now," Perera said. "But we have noticed that it's working and that means that the protein is not decomposed in the light and electric generating conditions. Because of that we believe that we've actually made the first protein-incorporated solar cell."

In February, Perera was one of two K-State graduate students named a winner at the ninth annual Capitol Graduate Research Summit in Topeka. She received a $500 scholarship from KansasBio and will present her poster, "Design of a 'Greener' Solar Cell using Mycobacterial Protein MspA," at the organization's board of director's meeting in May.

Perera said the summit benefited her research because it gave her the chance to share her work with state legislators in addition to the scientific community. As a result, legislators can understand the work and how it affects Kansas.

"We know that fossil fuels are going to run out in the very near future," Perera said. "Kansas is getting a reputation as one of the central places in the U.S. for alternative energy research because of the abundance of sunlight and wind. I want to contribute to that and to the betterment of humanity with this research."

Provided by Kansas State University

Citation: Research finds bright future for alternative energy with greener solar cells (2012, April 9) retrieved 28 April 2024 from
https://phys.org/news/2012-04-bright-future-alternative-energy-greener.html