New breakthrough shows promise for affordable plastic solar energy cells

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(PhysOrg.com) -- University of Florida researchers report they have achieved a new record in efficiency with a prototype solar cell that could be manufactured using a roll-to-roll process.

“Imagine making solar panels by a process that looks like printing newspaper roll to roll,” said Franky So, a UF professor in the department of materials science and engineering.

Industry has eyed the roll-to-roll manufacturing process for years as a means of producing solar cells that can be integrated into the exterior of buildings, automobiles and even personal accessories such as handbags and jackets. But, to date, the photovoltaic sheets cannot muster enough energy per square inch to make them attractive to manufacturers.

The UF team has crossed the critical threshold of 8 percent efficiency in laboratory prototype solar cells, a milestone with implications for future marketability, by using a specially treated zinc oxide polymer blend as the electron charge transporting material. The full report outlining the details of their latest laboratory success in solar cell technology is published in the Dec. 18 online version of *Nature Photonics*.

The researchers said the innovative process they used to apply the zinc oxide as a film was key to their success. They first mixed it with a polymer so it could be spread thinly across the device, and then removed the polymer by subjecting it to intense ultraviolet light.

John Reynolds, a UF professor of chemistry working on the project, said the cells are layered with different materials that function like an electron-transporting parfait, with each of the nano-thin layers working together synergistically to harvest the sun's energy with the highest efficiency.

Reynolds' chemistry research group developed an additional specialized polymer coating that overlays the zinc oxide polymer blend.

"That's where the real action is," he said. The polymer blend creates the charges, and the zinc oxide layer delivers electrons to the outer circuit more efficiently."

Reynolds' chemistry research team is aligned in an ongoing collaboration with So's materials science team, which they call "The SoRey Group."

The most recent fruit of their collaboration will now go to Risø National Laboratory in Denmark, where researchers will replicate the materials and processes developed by the SoRey Group and test them in the roll-to-roll manufacturing process.

"This sort of thing can only happen when you have interdisciplinary groups like ours working together," said Reynolds.

Provided by University of Florida

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