Solar power could get boost from new light absorption design

November 2 2011

Solar power may be on the rise, but solar cells are only as efficient as the amount of sunlight they collect. Under the direction of a new professor at Northwestern University's McCormick School of Engineering and Applied Science, researchers have developed a new material that absorbs a wide range of wavelengths and could lead to more efficient and less expensive solar technology.

A paper describing the findings, "Broadband polarization-independent resonant light absorption using ultrathin plasmonic super absorbers," was published Tuesday in the journal *Nature Communications*.

"The solar spectrum is not like a laser – it's very broadband, starting with UV and going up to near-infrared," said Koray Aydin, assistant professor of electrical engineering and computer science and the paper's lead author. "To capture this light most efficiently, a solar cell needs to have a broadband response. This design allows us to achieve that."

The researchers used two unconventional materials – metal and silicon oxide – to create thin but complex, trapezoid-shaped metal gratings on the nanoscale that can trap a wider range of visible light. The use of these materials is unusual because on their own, they do not absorb light; however, they worked together on the nanoscale to achieve very high absorption rates, Aydin said.

The uniquely shaped grating captured a wide range of wavelengths due to the local optical resonances, causing light to spend more time inside the material until it gets absorbed. This composite metamaterial was also able to collect light from many different angles – a useful quality when dealing with sunlight, which hits solar cells at different angles as sun moves from east to west throughout the day.

This research is not directly applicable to solar cell technology because metal and silicon oxide cannot convert light to electricity; in fact, the photons are converted to heat and might allow novel ways to control the heat flow at the nanoscale. However, the innovative trapezoid shape could be replicated in semiconducting materials that could be used in solar cells, Aydin said.

If applied to semiconducting materials, the technology could lead to thinner, lower-cost, and more efficient solar cells, he said.

Provided by Northwestern University

Citation: Solar power could get boost from new light absorption design (2011, November 2) retrieved 1 May 2024 from https://phys.org/news/2011-11-solar-power-boost-absorption.html