

# Team makes breakthrough in solar energy research

July 30 2013, by Kenneth K Ma

---



Black metal samples with different nanostructures thickness and coated with aluminum laying over a high reflective flat aluminum surface.

The use of plasmonic black metals could someday provide a pathway to more efficient photovoltaics (PV) — the use of solar panels containing photovoltaic solar cells — to improve solar energy harvesting, according to researchers at Lawrence Livermore National Laboratory (LLNL).

The LLNL Materials Engineering Division (MED) research team has made breakthroughs experimenting with black metals. These nanostructured metals are designed to have low reflectivity and high absorption of visible and [infrared light](#). The MED research team recently published their black metals research results in a cover-page article in the May issue of *Applied Physics Letters* titled "Plasmonic Black Metals in Resonant Nanocavities."

Authored by MED physicist and research team member Mihail Bora, the article details the work of the Nanophotonics and Plasmonics research team led by LLNL Engineer Tiziana Bond.

It describes the team's concept of black metals, which are not classic metals but can be thought of as an extension of the black silicon concept. When silicon is treated in a certain way, such as being roughened at the nanoscale level, it traps light by multiple reflections, increasing its solar absorption. This gives the silicon a black surface that's able to better trap the full sun's [wavelength spectrum](#).

Similarly, black metals are produced by some sort of random nanostructuring—either in gold or silver—without guaranteeing a full, reliable and repeatable full solar absorption. However, Bond's team developed a method to improve and control the absorption efficiency and basically turn the metals as black as they want, allowing them to increase, on demand, the absorption of a higher quantity of solar wavelengths. Her team built nanopillar structures that are trapping and absorbing all the relevant wavelengths of the entire [solar spectrum](#).

"Our article was picked for the cover story of *Applied Physics Letters* because it represents cutting-edge work in the area of plasmonics, the broadband operation obtained with a clear design and its implication for the photovoltaic (PV) yield," Bond said.

This new LLNL technology could one day be used in the energy harvesting industry such as PV. By incorporating metallic nanostructures with strong coupling of incident light, broad spectral and angular coverage, the LLNL team is providing a path for more efficient [photovoltaics](#) and thermovoltaics (a form of energy collection) by means of plasmon-exciton conversion, according to Bond and Bora.

**More information:** Paper:

[apl.aip.org/resource/1/applab/v102/i25/p251105\\_s1](http://apl.aip.org/resource/1/applab/v102/i25/p251105_s1)

The teams' black metal research will also be featured in the September issue of *Nature Photonics*.

Provided by Lawrence Livermore National Laboratory

Citation: Team makes breakthrough in solar energy research (2013, July 30) retrieved 21 May 2024 from <https://phys.org/news/2013-07-team-breakthrough-solar-energy.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--