

# Engineers solve energy puzzle

November 6 2011

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University of Toronto materials science and engineering (MSE) researchers have demonstrated for the first time the key mechanism behind how energy levels align in a critical group of advanced materials. This discovery is a significant breakthrough in the development of sustainable technologies such as dye-sensitized solar cells and organic light-emitting diodes (OLEDs).

Transition metal oxides, which are best-known for their application as super-conductors, have made possible many sustainable technologies developed over the last two decades, including organic photovoltaics and organic light-emitting diodes. While it is known that these materials make excellent electrical contacts in organic-based devices, it wasn't known why.

## Until now

In research published today in *Nature Materials*, MSE PhD Candidate Mark T. Greiner and Professor Zheng-Hong Lu, Canada Research Chair (Tier I) in Organic Optoelectronics, lay out the blueprint that conclusively establishes the principle of energy alignment at the interface between transition metal oxides and [organic molecules](#).

"The energy-level of molecules on materials surfaces is like a massive [jigsaw puzzle](#) that has challenged the scientific community for a very long time," says Professor Lu. "There have been a number of suggested theories with many critical links missing. We have been fortunate to successfully build these links to finally solve this decades-old puzzle."

With this piece of the puzzle solved, this discovery could enable scientists and engineers to design simpler and more efficient [organic solar cells](#) and OLEDs to further enhance sustainable technologies and help secure our energy future.

Provided by University of Toronto

Citation: Engineers solve energy puzzle (2011, November 6) retrieved 11 July 2024 from <https://phys.org/news/2011-11-energy-puzzle.html>

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