Engineers solve energy puzzle

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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