Scientists revolutionize solar power with new "gold nanocluster" technology

26 September 2014, by Jeff Renaud

Scientists at Western University have discovered that a small molecule created with just 144 atoms of gold can increase solar cell performance by more than 10 per cent. These findings, published recently by the high-impact journal *Nanoscale*, represent a game-changing innovation that holds the potential to take solar power mainstream and dramatically decrease the world's dependence on traditional, resource-based sources of energy, says Giovanni Fanchini from Western's Faculty of *Science*.

Fanchini, the Canada Research Chair in Carbon-based Nanomaterials and Nano-optoelectronics, says the new technology could easily be fast-tracked and integrated into prototypes of solar panels in one to two years and solar-powered phones in as little as five years.

"Every time you recharge your cell phone, you have to plug it in," says Fanchini, an assistant professor in Western's Department of Physics and Astronomy. "What if you could charge mobile devices like phones, tablets or laptops on the go? Not only would it be convenient, but the potential energy savings would be significant."

The Western researchers have already started working with manufacturers of solar components to integrate their findings into existing solar cell technology and are excited about the potential.

"The Canadian business industry already has tremendous know-how in solar manufacturing," says Fanchini. "Our invention is modular, an add-on to the existing production process, so we anticipate a working prototype very quickly."

Making nanoplasmonic enhancements, Fanchini and his team use "gold nanoclusters" as building blocks to create a flexible network of antennae on more traditional solar panels to attract an increase of light. While nanotechnology is the science of creating functional systems at the molecular level, nanoplasmonics investigates the interaction of light with and within these systems.

"Picture an extremely delicate fishnet of gold," explains Fanchini explains, noting that the antennae are so miniscule they are unseen even with a conventional optical microscope. "The fishnet catches the light emitted by the sun and draws it into the active region of the solar cell."

According to Fanchini, the spectrum of light reflected by gold is centered on the yellow colour and matches the light spectrum of the sun making it superior for such antennae as it greatly amplifies the amount of sunlight going directly into the device.

"Gold is very robust, resilient to oxidization and not easily damaged, making it the perfect material for long-term use," says Fanchini. "And gold can also be recycled."

It has been known for some time that larger gold nanoparticles enhance solar cell performance, but the Western team is getting results with "a ridiculously small amount" – approximately 10,000 times less than previous studies, which is 10,000 times less expensive too.

Provided by University of Western Ontario