Researchers develop eco-friendly color thin-film solar cells

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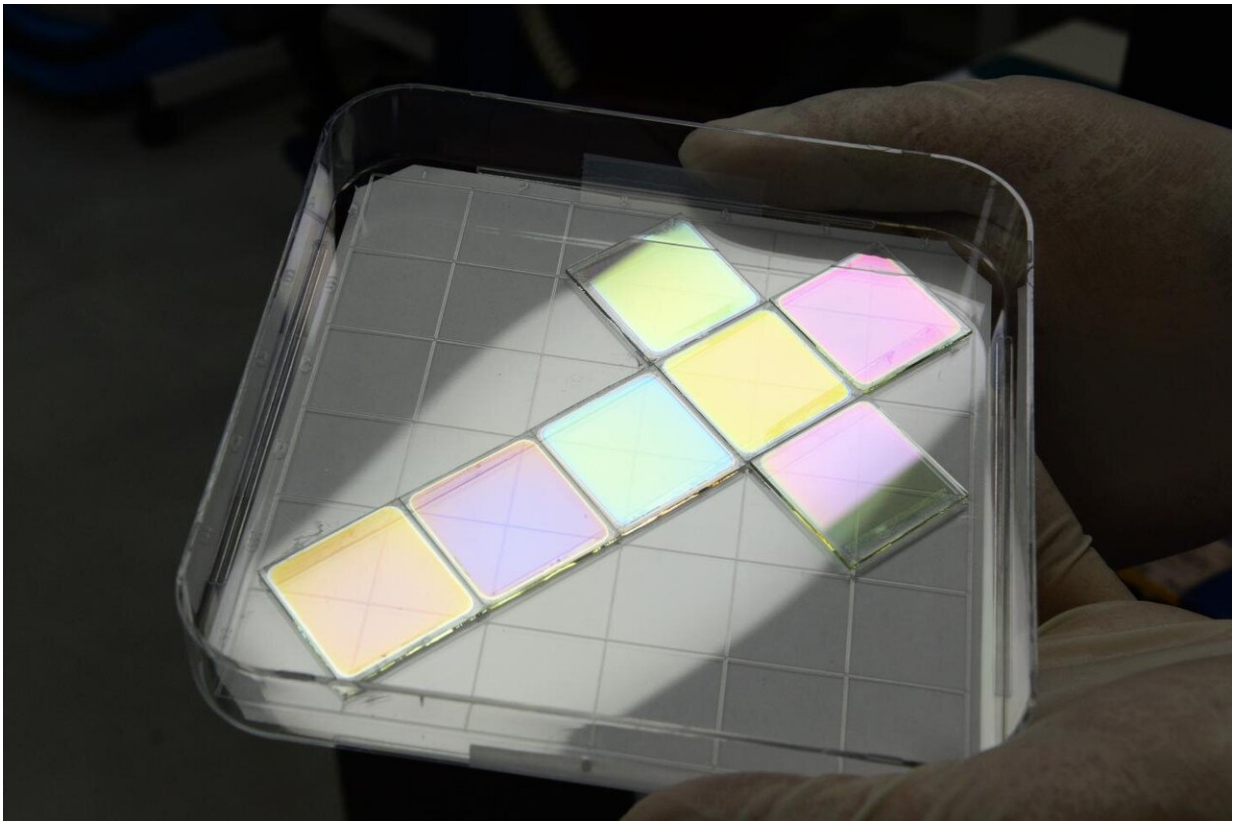


The eco-friendly color CIGS thin film solar cells developed by ETRI researchers. Credit: Electronics and Telecommunications Research Institute (ETRI)

Research on solar cells to secure renewable energy sources are ongoing around the world. The Electronics and Telecommunications Research

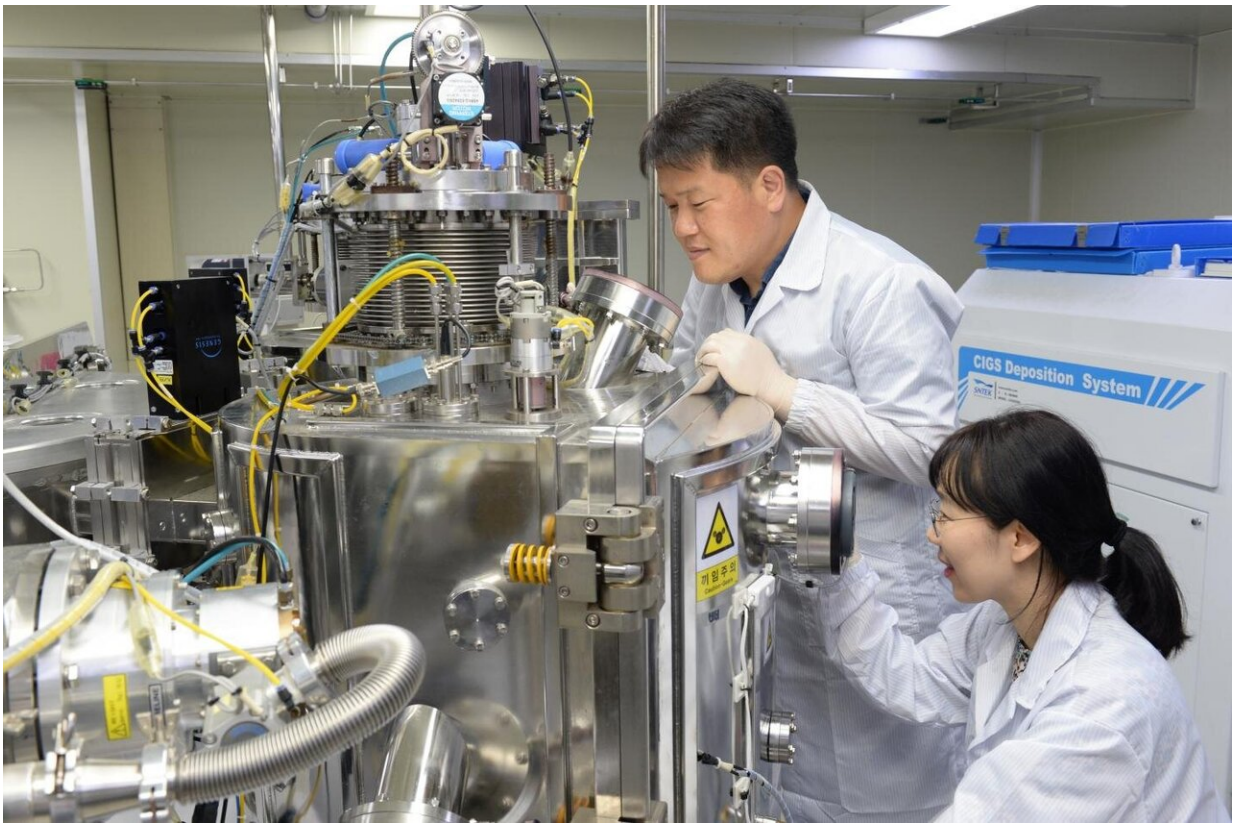
Institute (ETRI) in South Korea succeeded in developing eco-friendly color Cu(In,Ga)Se_2 (CIGS) thin-film solar cells.

CIGS thin-film solar cells are used to convert sunlight into electrical energy and are made by coating multiple thin films on a glass substrate. They have a relatively higher absorption coefficient among non-silicon based cells, resulting in high conversion efficiency and long stability. Also, they require less raw material compared to silicon-based cells; hence, lower process and material costs.

One downside has been the difficulty in commercialization as they have buffer layer containing cadmium, a toxic heavy metal. Thus, the ETRI team replaced the cadmium sulfide (CdS) buffer layer with materials based on zinc, which is not harmful, and achieved approximately 18% conversion efficiency, thus eliminating an obstacle to commercialization.

Likewise, the availability of more than seven colors including purple, green and blue without the need for additional process or cost means the technology is one step closer to full-on commercialization. Moreover, the researchers succeeded in identifying a new analysis method using photo-pumping terahertz spectroscopy and a mechanism for improving the conversion efficiency of solar cells with Zn-based buffer layers.The solar cells are thin and can be coated on a flexible substrate as well as a glass substrate. This means that they could be bent or folded, expanding applications as a next-generation eco-friendly energy source.

"This technology will contribute to the solar power system development through the production of high value-added color photovoltaic modules," said Yong-Duck Chung, the ETRI principal researcher.



ETRI researchers are monitoring the thin film solar cell process with CIGS deposition equipment. Credit: Electronics and Telecommunications Research Institute (ETRI)

The research is published in *Nano Energy*.

More information: Woo-Jung Lee et al, Ultrafast wavelength-dependent carrier dynamics related to metastable defects in Cu(In,Ga)Se2 solar cells with chemically deposited Zn(O,S) buffer layer, *Nano Energy* (2020). DOI: 10.1016/j.nanoen.2020.104855

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