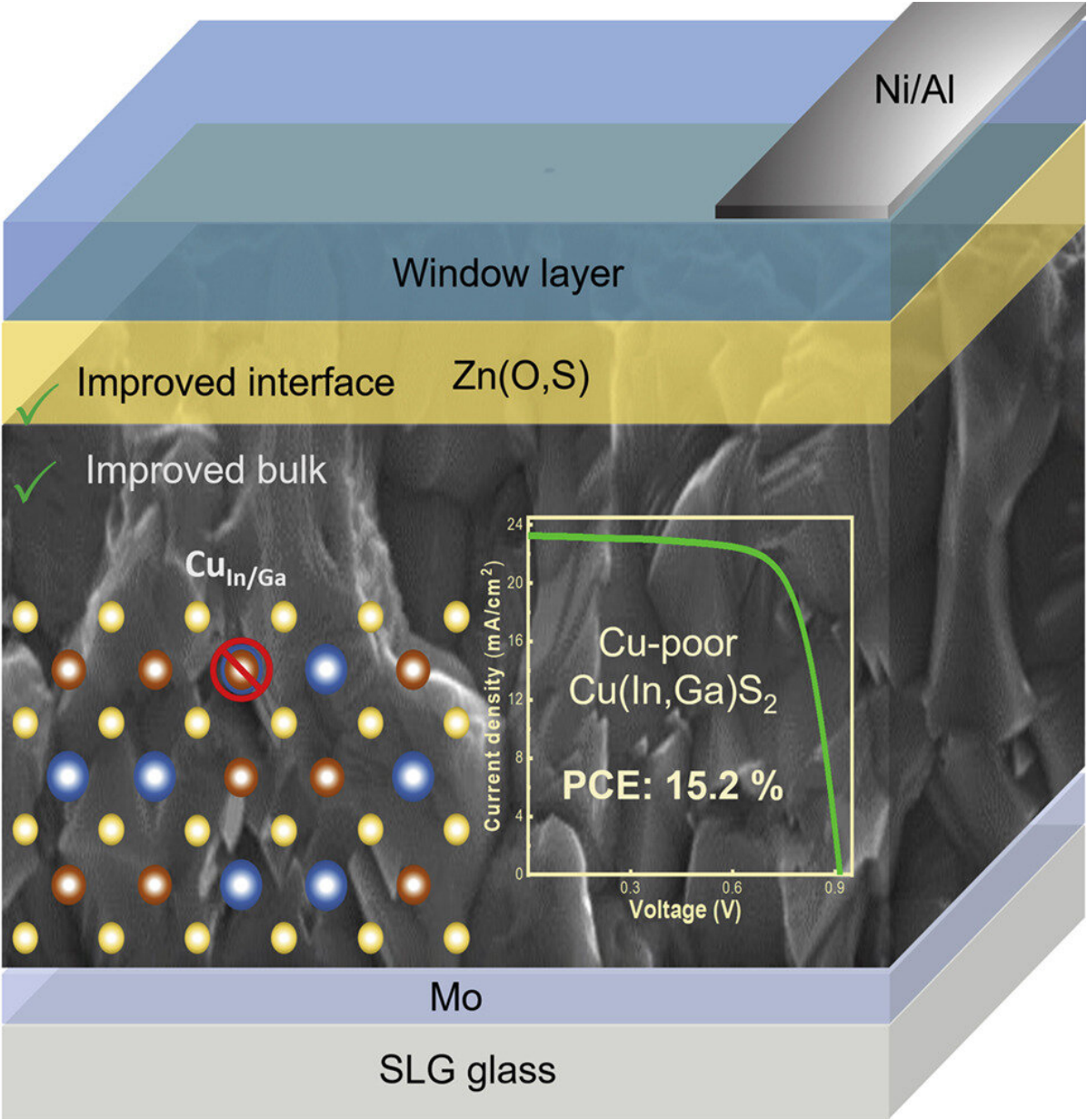


Researchers develop solar cell with efficiency of 14%

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Graphical abstract. Credit: <https://doi.org/10.1016/j.joule.2021.05.004>

A solar cell developed by physicists from the University of Luxembourg and Uppsala University has recently been certified with an efficiency of 14%, which comes close to the world record of 15.5%. These new findings have been recently accepted for publication in the international journal of energy research *Joule*.

Solar cells technology has seen significant progress over the last decades, putting solar cells among the lowest cost sources of electricity in central Europe. Solar cells have fundamental physical limitations, and they can never be 100% efficient.

Promising new technologies

Materials for solar cells are always a compromise between losing less light and losing less of the energy. This balance can be improved considerably by using two different materials and making a tandem solar cell—solar cells which combine two [individual cells](#) and make better use of the solar spectrum. Their efficiency can be larger than 30%. Current solar cells technologies that are based on a single solar cell are limited to efficiencies below this value. $\text{Cu}(\text{In,Ga})\text{S}_2$ is a [semiconductor material](#) composed of the elements copper, indium, gallium and sulfur, that is used in tandem solar cells.

Sudhanshu Shukla and Mohit Sood from the Department of Physics and Materials Science (DPhyMS) at the University of Luxembourg have investigated the loss mechanisms in $\text{Cu}(\text{In,Ga})\text{S}_2$ solar [cells](#) and improved the material quality. In an effort to also improve the contact materials, they teamed up with Tobias Törndahl of the Uppsala University who has many years of experience with contact materials.

The result of this collaboration was a solar cell with a 14% efficiency, which can be considered to be only the beginning of further developments.

The 14% solar cell has been certified by the calibration laboratory at the Fraunhofer Institute for Solar Energy Systems.

"When we develop [solar cells](#) in our laboratory, we measure their efficiency under well-defined conditions. However, there can always be small fluctuations between different labs. Therefore, a few labs around the world have specialized in the certification of solar cell efficiencies. Their results are truly comparable and are therefore the only ones that are accepted for any claims of record efficiencies," explains Prof. Susanne Siebentritt, head of the laboratory for photovoltaics at the University of Luxembourg.

More information: Sudhanshu Shukla et al, Over 15% efficient wide-band-gap Cu(In,Ga)S₂ solar cell: Suppressing bulk and interface recombination through composition engineering, *Joule* (2021). [DOI: 10.1016/j.joule.2021.05.004](#)

Provided by University of Luxembourg

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