Doping no longer necessary for manufacturing silicon solar cells

29 January, 2016

THE NEXT generation of silicon solar cells may not require doping, leading to cheaper manufacturing processes and better power output. Scientists at The Australian National University (ANU), UC Berkeley and EPFL found they could build solar cells by sandwiching pure silicon between thin films of different materials, eliminating the chemical doping that conventional silicon cells rely on.

In this case, the researchers sandwiched a silicon wafer between a lithium fluoride layer and a molybdenum oxide layer. Lithium fluoride has a low binding energy of electrons, known as the work function, while molybdenum oxide’s is very high. The difference means that when sunlight hits the silicon and creates an electron-hole pair, the electron is drawn to the lithium fluoride, while the hole goes the opposite way, which creates an electric current.

This changes the idea of how silicon solar cells can be made, claim the researchers. Additionally, because they use very simple low-temperature fabrication procedures of below 200 degrees Celsius, they can potentially be manufactured for a lower cost, while still having high efficiencies.

Conventional doped cells are made at temperatures above 800 degrees Celsius. The new approach also eliminates the need for the toxic chemicals that are often required for the doping process.

The team’s best solar cell so far has achieved nearly 20 per cent efficiency, which is better than the industry average.

Professor Andres Cuevas, from the ANU Research School of Engineering, says the approach could allow the researchers to attain world record efficiencies of over 25 percent.

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