# Innovation puts next-generation solar cells on the horizon

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In a world first, a Monash University-led international research team has developed an innovative way to boost the output of the next generation of solar cells.

Scientists at Monash University, in collaboration with colleagues from the universities of Wollongong and Ulm in Germany, have produced tandem dye-sensitised solar cells with a three-fold increase in energy conversion efficiency compared with previously reported tandem dye-sensitised solar cells.

Lead researcher Dr Udo Bach, from Monash University, said the breakthrough had the potential to increase the energy generation performance of the cells and make them a viable and competitive alternative to traditional silicon solar cells.

Dr Bach said the key was the discovery of a new, more efficient type of dye that made the operation of inverse dye-sensitised solar cells much more efficient.

When the research team combined two types of dye-sensitised solar cell - one inverse and the other classic - into a simple stack, they were able to produce for the first time a tandem solar cell that exceeded the efficiency of its individual components.

"The tandem approach - stacking many solar cells together - has been successfully used in conventional photovoltaic devices to maximise

energy generation, but there have been obstacles in doing this with dye-sensitised cells because there has not been a method for creating an inverse system that would allow dye molecules to efficiently pass on positive charges to a semiconductor when illuminated with light," Dr Bach said.

"Inverse dye-sensitised solar cells are the key to producing dye-sensitised tandem solar cells, but the challenge has been to find a way to make them perform more effectively. By creating a way of making inverse dye-sensitised solar cells operate very efficiently we have opened the way for dye-sensitised tandem solar cells to become a commercial reality."

Although dye-sensitised solar cells have been the focus of research for a number of years because they can be fabricated with relative simplicity and cost-efficiency, their effectiveness has not been on par with high-performance silicon solar cells.

Dr Bach said the breakthrough, which is detailed in a paper published in *Nature Materials*, was an important milestone in the ongoing development of viable and efficient solar cell technology.

"While this new tandem technology is still in its early infancy, it represents an important first step towards the development of the next generation of solar cells that can be produced at low cost and with energy efficient production methods," he said.

"With this innovation we are one step closer to the creation of a cost-efficient and carbon-neutral energy source."

More information: Highly efficient photocathodes for dye-sensitized tandem solar cells, A. Nattestad , A. J. Mozer , M. K. R. Fischer , Y.-B. Cheng , A. Mishra , P. B|[auml]|uerle & U. Bach, *Nature Materials* (29 November 2009); doi:10.1038/nmat2588

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