

Magic solar milestone reached: UNSW claims 25 percent solar cell efficiency title

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University of New South Wales ARC Photovoltaic Centre of Excellence has reported the first silicon solar cell to achieve the milestone of 25 per cent efficiency.

The UNSW ARC Photovoltaic Centre of Excellence already held the world record of 24.7 per cent for silicon solar cell efficiency. Now a revision of the international standard by which solar cells are measured, has delivered the significant 25 per cent record to the team led by Professors Martin Green and Stuart Wenham and widened their lead on the rest of the world.

Centre Executive Research Director, Scientia Professor Martin Green, said the new world mark in converting incident sunlight into electricity was one of six new world records claimed by UNSW for its silicon solar technologies.

Professor Green said the jump in performance leading to the milestone resulted from new knowledge about the composition of sunlight.

"Since the weights of the colours in sunlight change during the day, solar cells are measured under a standard colour spectrum defined under typical operational meteorological conditions," he

said.

"Improvements in understanding atmospheric effects upon the colour content of sunlight led to a revision of the standard spectrum in April. The new spectrum has a higher energy content both down the blue end of the spectrum and at the opposite red end with, dare I say it, relatively less green."

The recalibration of the international standard, done by the International Electrochemical Commission in April, gave the biggest boost to UNSW technology while the measured efficiency of others made lesser gains. UNSW's world-leading silicon cell is now six per cent more efficient than the next-best technology, Professor Green said. The new record also inches the UNSW team closer to the 29 per cent theoretical maximum efficiency possible for first-generation silicon photovoltaic cells.

Dr Anita Ho-Baillie, who heads the Centre's high efficiency cell research effort, said the UNSW technology benefited greatly from the new spectrum "because our cells push the boundaries of response into the extremities of the spectrum".

"Blue light is absorbed strongly, very close to the cell surface where we go to great pains to make sure it is not wasted. Just the opposite, the red light is only weakly absorbed and we have to use special design features to trap it into the cell," she said.

Professor Green said: "These light-trapping features make our cells act as if they were much thicker than they are. This already has had an important spin-off in allowing us to work with CSG Solar to develop commercial 'thin-film' silicon-on-glass solar cells that are over 100 times thinner than conventional silicon cells."

ARC Centre Director, Professor Stuart Wenham said the focus of the Centre is now improving mainstream production.

"Our main efforts now are focussed on getting these efficiency improvements into commercial production," he said.

"Production compatible versions of our high efficiency technology are being introduced into production as we speak."

The world-record holding cell was fabricated by former Centre researchers, Dr Jianhua Zhao and Dr Aihua Wang, who have since left the Centre to establish China Sunergy, one of the world's largest photovoltaic manufacturers.

"China was the largest manufacturer of solar cells internationally in 2007 with 70 per cent of the output from companies with our former UNSW students either Chief Executive Officers or Chief Technical Officers", said Professor Green.

Source: University of New South Wales

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