

USING NANOTECHNOLOGY TO OPTIMISE PV CELL MANUFACTURE

LEAD ORGANISATION

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COST AND DURATION

The Carbon Trust contribution towards this project is £249,675. The project started in July 2008 and is due for completion in June 2010.

PROJECT REFERENCE NUMBER

077-167

OBJECTIVES

The objective of this project is to determine optimum methods of printing and recrystallising silicon on a substrate for the production of photovoltaic (PV) cells using nanotechnologies developed by Intrinsic Materials Ltd (IML).

SUMMARY

IML is a leading European materials technology company. It maintains a patented nanomaterial manufacturing platform technology, which enables the company to research and develop bespoke nanomaterials. These materials are then used by applications that enhance the performance and improve the competitive position of a product.

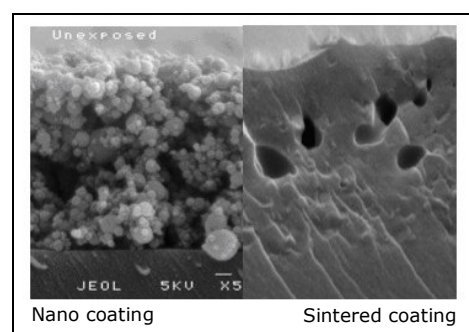
The supply of solar-grade silicon is a major bottleneck in the development and manufacture of PV cells. The production of PV cells using thin-film technology requires much less material when compared with that for wafer-based PV cells. Various solutions have been used and tested for the printing of silicon, but it invariably involves the use of expensive and hazardous compounds.

IML plans to develop a low-cost method of manufacturing high-purity silicon nanopowder and a low-cost printing technique. These will use common starting materials that remain safe and stable for decades.

IML proposes to print silicon nanopowder in uniform layers and then recrystallise it into silicon layers.

Using its patented plasma pyrolysis technologies, IML will:

- Synthesise novel feedstock materials, such as high-purity nanosilicon, from high-purity silica (sand) and other source materials



Cross-sectional view of nano coating and sintering on glass

- Develop a set of silicon nanopowder inks and trial coatings (nano coating and sintered coating) on suitable substrates while avoiding damage to the substrate layer
- Develop annealing and crystallisation processes while observing and optimising various characteristics such as impurities, layer thickness and depth of crystallisation
- Produce prototype PV cells and test their efficiency
- Compare progress and technical achievements with commercial reality.

IML will also use specialised UK thermal capabilities for the annealing and testing process and NanoRISK to help identify any nano-related health and safety issues in the programme.

Overall, this project aims to:

- Decrease the installed-capacity cost of PV cells (targeting £1-2/watt)
- Accelerate the uptake of PV power
- Improve the process efficiency of PV cell manufacture
- Improve PV cell efficiency.

It is estimated that the minimum accumulated reduction in CO₂ emissions by 2050 from using this technology would be 200,000 tonnes (based on market uptake estimations).

