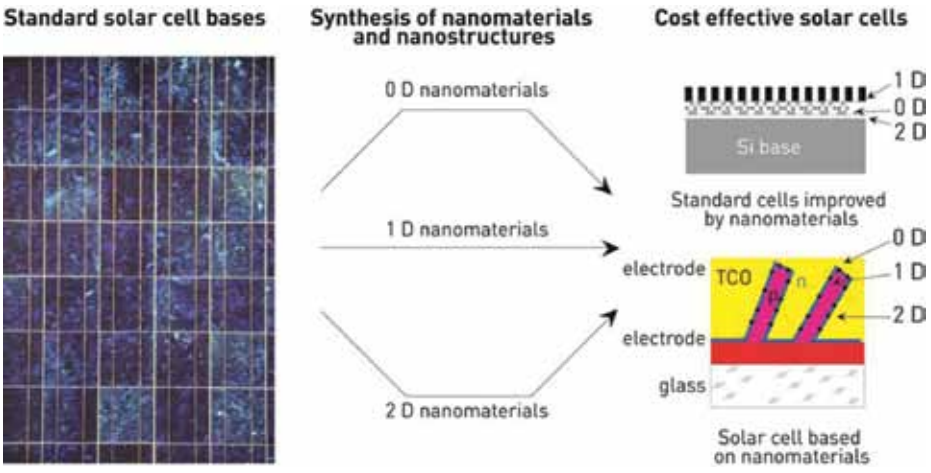
Nanomaterials and nanotechnology for advanced photovoltaics

The NanoPV project http://www.sintef.no/Projectweb/nanoPV/ aims at making a breakthrough step-change in photovoltaics by the removal of a set of bottlenecks which have been identified to block the application of nanostructures for high-efficiency, low-cost solar cells. The bottlenecks arise from the present lack of up-scalable processes that can meet the needs for nanomaterials in PV applications, and the lack of relevant equipment and industrial lines. In order to remove these bottlenecks, the main objectives of NanoPV are: (i) to develop technologies that can increase the efficiency and reduce the processing cost of existing silicon solar cell technologies using nano-scale effects provided by nanomaterials to above 20% for wafer based and above 15 % for thin film silicon based solar cells at a processing cost for modules well below 1 €/watt; (ii) to design and to fabricate low cost solar cells entirely from nanomaterials by using nanostructures (Fig.1). An efficiency of above 10 % at processing costs well below 1 €/watt is targeted with potential of further significant improvements in the future; (iii) to develop up-scalable cost effective processes and equipment in order to implement both enhanced standard solar cells and solar cell based on nanomaterials as well as related modules to existing pilot and industrial lines; (iv) to create new market opportunities for the industrial partners.

Nanotechnology is applied for both already existing conventional Si solar cells (wafer and thin-film based) and for advanced solar cells entirely based on nanostructures. The main scientific efforts are focused on understanding and exploitation of such nanomaterials as: (i) 0D quantum dots, nanocrystals and nanoparticles, (ii)1D nanowires and nanorods, and (iii) 2D nanomaterials such as ultrathin layers.

A large number of specialised technologies under the consideration in the project. Therefore, in order to ensure successful completion, a comparatively large consortium of 9 complementary research partners: Stiftelsen SINTEF, Norway (Coordinator); Energy Research Centre of the Netherlands (ECN, Netherlands); Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (HZB, Germany); University of Valencia (Spain); Walter Schottky Institute, Technical University Munich (Germany); Institute of Photonic Technology (IPHT, Germany); Consiglio Nazionale Delle Ricerche, Laboratorio Nazionale MDM (CNR, Italy); Rudjer Boskovic Institute (RBI, Croatia); Central Laboratory of Solar Energy and New Energy Sources Bulgarian Academy of Sciences (CLS); and 3 industries: Oxford Instruments Plasma Technology Ltd. (OIPT, UK); SCHOTT Solar AG (Germany) and Innovative Materials Processing Technology Ltd. (IMPT, UK) has been assembled.



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