Fraunhofer
ISE

Press Release

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Façade Integration in Sight

Fraunhofer ISE Presents Worldwide Largest Screen-Printed Dye Solar Cell Module

The dye solar cell module is still a young photovoltaic technology. However, in the last few years, this technology has started to extend beyond the laboratory level. The ultimate aim is the successful integration of these solar modules into the building façade. A large challenge in the development of new photovoltaic technologies is the transfer from the laboratory to the industrial level. As a step in this direction, researchers at Fraunhofer ISE have succeeded in producing the worldwide first dye solar cell module on a continuous substrate material with dimensions of 60 x 100 cm². An important hurdle has been overcome.

In an extensive series of laboratory tests, the researchers at Fraunhofer ISE succeeded in manufacturing prototypes of large-area dye solar modules on glass. "For the first time, we were able to show that an integrated series connection of cells is possible on a module area of 60 x 100 cm² using screen printing technology," explains a delighted Dr. Andreas Hinsch. "This avoids a complex external connection of the submodules. With this prototype, we have achieved a decisive step towards cost-effective up-scaling and paved the way for the transfer to the industrial level."

At Fraunhofer ISE, dye solar cell modules are manufactured with meander design. The glass frit sealing, stable over the long-term, is also applied by a screen printing process. Dye modules open up new design possibilities for building-integrated façades and other decorative applications. A short time ago, efficiencies of 7.1 percent, with respect to the active area, were reached at Fraunhofer ISE for dye solar cell modules of dimensions of 10 x 10 cm². The same

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manufacturing procedure was used for the small modules and the up-scaled modules.

Dye solar cells are photoelectrochemical solar cells. The conversion process is similar to photosynthesis. In principal, they are simple to manufacture and present a prime example for the research behind and the realization of functionalizing nanomaterials. Dye solar cells are based on a nanocrystalline carrier layer made of titanium dioxide TiO_2 whose surface is chemically bonded with dye molecules. A small amount of gel electrolyte is used for the transport of the carriers.

The manufacture of the 60 x 100 cm² modules was carried out using industry-relevant procedures and machines. For applying the dye and the electrolyte, a customized, in-house development was necessary. Therefore, in cooperation with the Fraunhofer IAO in Stuttgart, Fraunhofer ISE developed a station for automatically filling and sealing the large area dye solar cell modules. With this apparatus, the further manufacture of modules for future demonstration projects is guaranteed, and a decisive step towards a pilot processing line has been accomplished. Fraunhofer ISE is now considering plans for a spin-off company so that first demonstration systems can be realized.

The on-going work on dye solar cell modules at Fraunhofer ISE is carried out within joint projects sponsored by the Federal Ministry of Education and Research (BMBF), the European Commission and the Ministry of the Environment, Baden-Württemberg.

Fraunhofer ISE is the largest European solar energy research institute. For the past thirty years, Fraunhofer ISE has been working closely with industry to develop new technologies in the area of solar cells. In addition to its focus on silicon solar cells, comprehensive research is being carried out on dye and organic solar cells as well as multi-junction and concentrator III-V semiconductor solar cells.

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More information on dye solar cell projects in which Fraunhofer ISE has a substantial part can be found at:
http://www.fsz-industrie.de/

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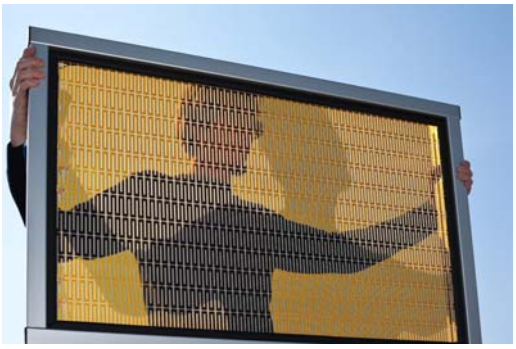

Prototype of a 60 x 100 cm² dye solar cell module manufactured at Fraunhofer ISE using a screen-printing process. ©Fraunhofer ISE

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