

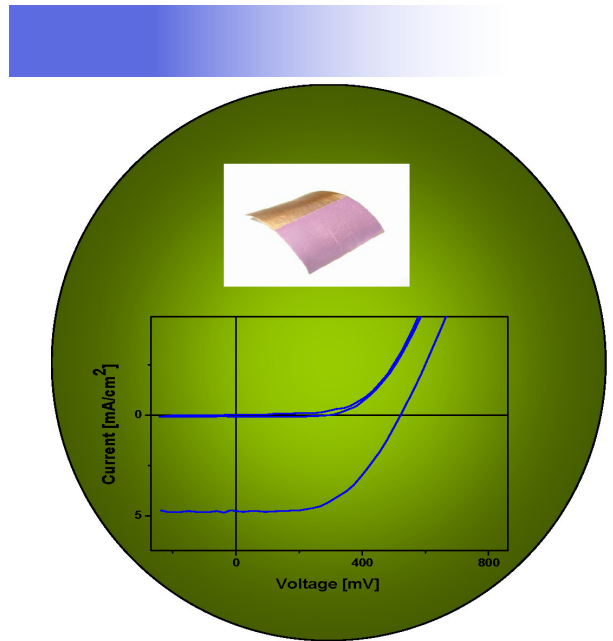
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Aqueous Slurries for Low-Temperature Coating of TiO₂ Photoanodes

Invention Summary: Rutgers researchers have formulated aqueous slurries of nanosized titanium dioxide which can be annealed at low temperature. Annealing is an important step in the fabrication of dye sensitized solar cells (DSSCs), but usually is done at 450°C. Such elevated temperature is energy consuming, and forbids the use of plastic flexible substrates. Organic solvents are also used, which can have an impact on the environment. In our process, water is used as the solvent, and a small amount of acid (H₂SiF₆) enables particle connection at low temperature (150°C). Appropriate particle size distribution is also key to combine particle interconnection and good solar cell efficiency. Using this technology, Rutgers researchers have developed flexible dye sensitized solar cell constructions methods, which include lamination with polymer electrolyte, cell sealing and metal mesh current collectors. Moreover, the phenomenon of a significant electric conduction with illumination can be utilized for applications with combined photovoltaic and diode effects; for example, light sensor (photo-diode), optical non-volatile memory and optical MEMS

(micro-electro-mechanical system) applications.

Market Application: Photovoltaics.

Advantages: Flexible dye sensitized solar cells provide product advantages of light weight, impact resistance and conformation to curved surfaces. At the manufacturing level, flexibility of the photoanodes enables roll-to-roll coating and assembly of the cells. This results in lower manufacturing costs and reduced initial investment for production.

Intellectual Property & Development Status: A provisional patent application has been filed.

Recent Publications :

- Aurelien Du Pasquier, Matthew Stewart, Timothy Spitler and Mike Coleman, Aqueous Coating of Efficient Flexible TiO₂ Dye Solar Cell Photoanodes, Solar Energy Materials and Solar Cells, 93 528–535 (2009)
- Aurelien Du Pasquier, Electrochimica Acta, An Approach to Laminated flexible Dye Sensitized Solar Cells, 52, 7669-7474 (2007)