

Inorganic Chemistry | Technology Offer

Grätzel Thin-Film Solar Cells Incorporating Bismuth Compounds as Light Absorbing Components

Market and Application

Grätzel cells are already being incorporated in many textiles e.g. backpacks, awnings and tents. A market for dye-sensitized solar cells is also developing in the integration of photovoltaics in buildings: thin-film Grätzel modules can be completely integrated into the building walls or into construction elements (roof, windows etc.). Its application in the interior of buildings is also possible, for example for daytime illumination, because these cells are effective in transforming diffuse light (including electrical lighting) into electrical current. Grätzel cells are also taking over shares of silicon based solar cells in mobile applications. Starting from these niche applications, the Grätzel cell catch up more and more with the conventional photovoltaic technology in terms of cost per Watt.

Current Status of the Technology

Grätzel cells are currently produced industrially and in large quantities. The current focus is on finding materials that allow the cost per kW to be reduced while at the same time improving the cells' environmental compatibility. The present invention represents a major step in this direction. The Grätzel cell almost already matches the efficiency of silicon based solar cells. The difficulties experienced with the sealing of the electrolytes within the cells have been overcome and the thermal long-term stability of the dyes is now meeting the market needs.

Invention

The present technology is a broad and fundamental invention of the Karlsruhe Institute of Technology (KIT) for the production of Grätzel cells. The invention consists of a thin-film solar cell built like a Grätzel cell, but using Bismuth compounds as light absorbing medium instead of, for instance, organic Ruthenium complexes. The absorption characteristics can be modified via the type of Bismuth compounds being used. Many of the Bismuth compounds used can simultaneously act as electrodes. This means that the two functional layers, the first for light absorption and the others for conducting electrons, can be combined into a single one. The selection of the appropriate Bismuth compound further allows the cells to be optimized for specific light conditions.

Your Advantages at a Glance

- Reduced production costs compared with conventional solar cells and dye-sensitized cells
- Reduction in the number of functional layers of the cell – very simple and unique construction
- Adjustable absorption characteristics via the type of Bismuth compound
- Easy development of tandem thin-film solar cells
- Production by using commercially available equipment
- More environmental-friendly thanks to the reduced toxicity of the Bismuth compounds used

Search for Cooperation!

We are in search of a commercial partner that is either involved in the industrial production of Grätzel cells and who is looking to optimize their product, or of a company that is currently producing thin-film solar cells and recognizes the Grätzel cell as the product of the future and who would like to enter this market. In either case, this technology would provide a broad base to build a successful commercial product line. The invention has reached the "proof of concept" stage, and it is our intention to develop it for industrial use in collaboration with a suitable industrial partner. In particular, it is our aim that the results of national research grant projects and EU projects will be commercialized through this partnership with industry.

Technology Transfer

The Technologie-Lizenz-Büro (Technology Licensing Office) GmbH is entrusted with the commercialization of this technology and now offers companies an opportunity to close a licensing agreement.

Patent Portfolio

A German patent application was filed in July 2009; an international PCT patent application is pending.

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