NANOTUBE ARRAY PHOTOCATALYSTS

PROPRIETARY TECHNOLOGY PROFILE

OVERVIEW

Heterogeneous photocatalysis is used in a number of applications, from photo-induced water splitting for hydrogen production to water purification and environmental cleanup. However, the utility of today's photocatalytic materials is limited by a number of factors, such as bandgap poorly matched o solar spectrum, low chemical conversion efficiency and in many cases poor stability in the application environment. In addition, for many applications to enter the broad markets, the cost of these materials has to come down. Synkera Technologies Inc. is developing highly efficient, long lifetime, and cost-effective photocatalysts and is seeking product development and commercialization partners.

MAIN FEATURES

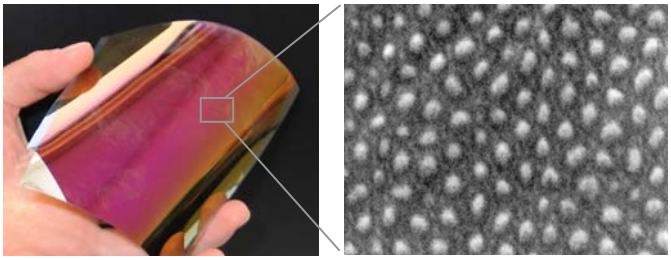
Synkera's approach is based on high-density arrays of nanotubes with unique coaxial architecture. These nanotubes integrate conductive layer, semiconductor adsorber with vertically graded bandgap, and chemically robust electrochemical interface coating. The main enabling features and resulting benefits are:

- large absorption cross-section to enhance light harvesting, high surface area to promote catalytic chemistry
- rapid and efficient charge separation to minimize recombination losses in a very thin absorber
- broadband light absorption and maximized efficiency by vertically graded band gap;
- long lifetime due to using corrosion-resistant conformal layers of titania as an electrochemical interface
- scalability to large size and high volumes, inherently low cost in comparison with competitive technologies.

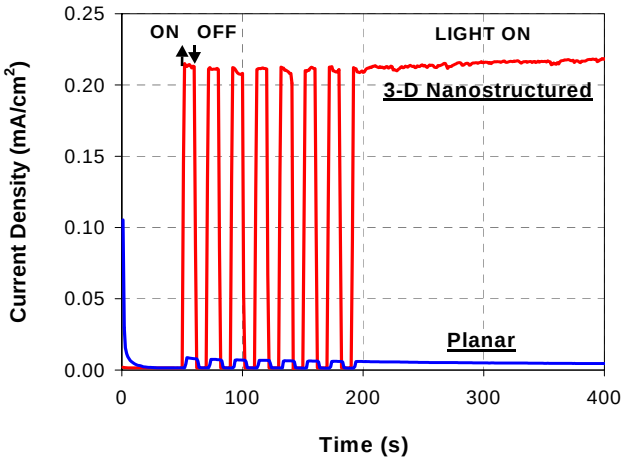
This approach enables several photocatalyst designs and takes advantage of a new templated process for nanoarray synthesis developed by Synkera. Resulting ability to fabricate such complex architecture reliably and with great precision is a key to development of highly competitive photocatalyst.

Status

Synkera demonstrated the feasibility of the approach using doped TiO_2 nanotube arrays with coaxial conductor. Significant improvements in their photoelectrochemical performance in comparison with planar structures were realized: appr. x25 increase in photocurrent density and excellent stability in 0.1 M KOH. Spectral sensitivity and conversion efficiency measurements are in progress.



Left: Flexible thin film nanoporous matrix on Mylar. Right: Arrays of templated inorganic nanorods.



Photocurrent density for "3-D nanoarray" prototype and its planar equivalent made of the same materials in identical conditions (Grätzel-cell configuration, 0.5V, illuminated by filtered Xe lamp)

PARTNERSHIP DEVELOPMENT

Joint development partnerships are being sought to develop, validate and commercialize the described photocatalysts. Synkera is pursuing federal funding to support development of this technology and to cross-leverage any commercial interests. If you would like to discuss this further or need additional information, please contact:

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