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## Nanoscale engineering of hematite and bismuth vanadate photoanodes for water splitting in PEC

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Solar energy is not steadily available throughout the day. This requires a facility to store energy for which batteries and capacitors are commonly used. An alternative method is to store the energy in the form of a chemical from which it could be regained subsequently. Hydrogen is one such product which could be generated by electrolytically splitting water. Conventional electrolysis of water using electrons obtained from a photovoltaic device requires charge conduction over long distances with its inherent energy losses. The charge conduction distances could be reduced to millimeters, or even micrometres, if the photovoltaic action could be realized at the electrode itself. This is the concept of a photo-electro-chemical cell (PEC) which uses photo active electrodes that capture photons and convert them to charges namely, electrons and holes. Considerable effort has been expended in recent times to develop an efficient photo active anode as the oxygen evolution reaction has the higher energy barrier. This presentation will detail the developments achieved in in two candidate photoanode materials, hematite (Fe2O3) and bismuth vanadate (BiVO4). The hematite nanorod structured anodes were doped with Sn which improved its charge transport ability. An overlayer of TiO2 improved its performance by facilitating hole injection at the interface with the electrolyte [1]. The porous BiVO4 anode required 3% Mo doping and a WO3 underlayer and Co-Pi overlayer to improve the performance. In both anodes, increasing the illumination area decreased the photocurrent density which we term the “the areal effect” [2]. The areal effect needs to be investigated further and circumvented. Besides, the stability and durability of the anodes in the chosen electrolytes must also be evaluated.

### Biography

Thirumany Sritharan is a professor at the School of Materials Science and Engineering, NTU Singapore. His expertise is in multiferroic materials, thin films and solar energy harvesting. He is currently the main PI in NTU for the multi-million $ CREATE program between NTU-Singapore, University of California – Berkeley and NUS – Singapore. This program is fully funded by the National Research Foundation of Singapore under their CREATE umbrella funding program. It is on the topic of Sustainable Energy and has a total of about 60 researcher from both Singapore and Berkeley. Prior to this Sritharan worked on multiferroic materials with special attention BiFeO3 epitaxial thin films and also on various thin film and interfacial problems in microelectronic circuits. He obtained his PhD from The University of Sheffield, UK and worked at The University of Melbourne and Comalco Research Centre, Melbourne before joining NTU Singapore

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