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Improvements and scale up of $BiVO_4$ photoanode for water splitting in photo electrochemical cells

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The monoclinic scheelite BiVO4 is recognized as one of the promising candidate materials for photoanode because of its 9.1% theoretical solar-to-hydrogen efficiency. While significant research effort has been devoted to improving the photoelectrochemical cell performance of this material, they have mainly been in small anode areas. This talk will give the methodologies employed to produce a scaled-up 5x5 cm^2 photoanode and give results of its performance in a large photoelectrochemical cell to split water. Multiple modifications were made, by systematic experimental evaluations, to enhance the performance of the anode. These are: use of an under layer, an over layer of co-catalyst, and doping the $BiVO_4$ with Mo. These will be described. An adverse effect of area was noted in our studies which we call the "areal effect". The photocurrent density steadily decreased with increase of illumination area. Evidence to specifically verify the areal effect were obtained experimentally and will be discussed. This is the first documented evidence for this effect. Understanding the reasons for the areal effect is indispensable for the development of large scale PEC devices for water splitting. Preliminary information on the stability of the large area anode in the electrolyte will also be shown and discussed.

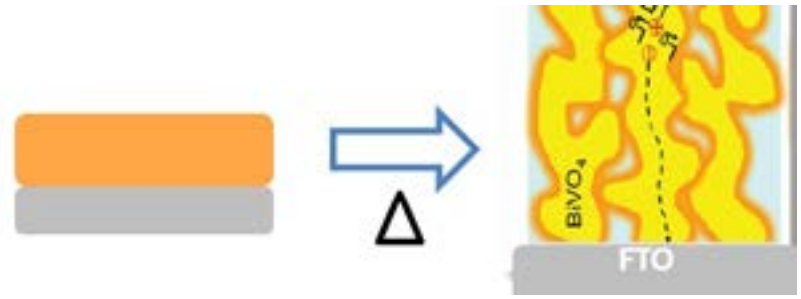

Figure.1: $BiVO_4$ photo anode on FTO substrate. The $BiVO_4$ is porous.

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 researchers from both Singapore and Berkeley. Prior to this, he has worked on multiferroic materials with special attention BiFeO3 epitaxial thin films and on various thin film and interfacial problems in microelectronic circuits. He has 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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