



Contribution ID: 450

Type: Poster Presentation

Thermal and compositional defects in dip-coated iron oxide (α -Fe₂O₃) thin film photoanodes: Effects on film properties

Tuesday, 30 June 2015 16:10 (1h 50m)

Abstract content
 (Max 300 words)
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Hematite (α -Fe₂O₃) is an attractive semiconductor material for solar assisted electrolysis of water due to its narrow band (~ 2.1 eV), low cost and non-toxicity. α -Fe₂O₃ thin films photoanodes were synthesized by dip coating and their properties investigated with FESEM, XRD and photocurrent density spectroscopy. Strong dependence of structural and photoelectrochemical properties on film compositions and temperature was observed. The crystallites size was observed to increase with increasing Ti doping concentration. By fixing the doping concentration at 1 mol %, the photocurrent density at water splitting potential (1.23 V vs RHE) increased from 0.006 mA/cm² at 450 °C to 0.386 and 0.766 mA/cm² at 500 and 550 °C respectively then decreased to 0.249 mA/cm² at 600 °C. Subsequent annealing temperatures introduced textural and structural defects with modifications in the film properties. The films cracked with cracks averaged 50 nm. Cracks may act as collection centres for impurities diffusing out of the lattice hence act as scattering sources for photons and carriers with consequent decrease in photoresponse of the films.

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N/A

Main supervisor (name and email) and his / her institution

Dr Mmantsae Diale

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Session Classification: Poster1

Track Classification: Track A - Division for Physics of Condensed Matter and Materials