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Si is an excellent absorber material for use in photoelectrochemical (PEC) hydrogen production. Only a few studies have been done using Si in alkaline electrolyte for hydrogen evolution due to its poor chemical stability in high pH electrolyte, indicating that a chemically stable protection layer is essential. Here we investigate thin TiO2 films deposited by high power impulse magnetron sputtering (HiPIMS) as a protection layer for a p-type silicon photocathode for photoelectrochemical H2 evolution in a high pH electrolyte. The X-ray reflectometry analysis reveals that the HiPIMS process provides improved film density for TiO2 films (4.15 g/cm3), and consequently results in a significantly less corroded Si surface. The Si photocathode protected by the HiPIMS grown TiO2 film along with Pt as co-catalyst produced a photocurrent onset potential of ~0.5 V vs. RHE in 1 M KOH and showed a 4% decay over 24 h in KOH. In contrast, the sample with the TiO2 deposited using conventional DC sputtering technique of similar thickness shows 20% loss in photocurrent for the same time interval. Considering the fact that the experiments were carried out not in the cleanroom, much less corrosion loss can be obtained if done in dust-free condition. Hence, these results suggest the HiPIMS technique as an improved approach for the protection of photoelectrodes, which are unstable in alkaline solution.

General information
Publication status: Published
Organisations: Department of Physics, Experimental Surface and Nanomaterials Physics, Department of Micro- and Nanotechnology, Silicon Microtechnology, University of Iceland
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Pages: 758-765
Publication date: 2016
Peer-reviewed: Yes

Publication information
Volume: 144
ISSN (Print): 0927-0248
Ratings:
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.97 SJR 1.599 SNIP 1.697
Web of Science (2016): Impact factor 4.784
Web of Science (2016): Indexed yes
Original language: English
Keywords: Photocatalysis, Titanium dioxide, High power impulse magnetron sputtering, Hydrogen evolution
DOIs:
10.1016/j.solmat.2015.10.020
Source: PublicationPreSubmission
Source ID: 117917359
Research output: Contribution to journal › Journal article – Annual report year: 2015 › Research › peer-review