

# Accepted Manuscript

Full Length Article

Single Material TiO<sub>2</sub> Thin Film by Atomic Layer Deposition for Antireflection and Surface Passivation Applications on P-Type C-Si

Tsung-Cheng Chen, Tsuo-Chuan Yang, Hsyi-En Cheng, Ing-Song Yu, Zu-Po Yang

PII: S0169-4332(18)31035-3  
DOI: <https://doi.org/10.1016/j.apsusc.2018.04.078>  
Reference: APSUSC 39077

To appear in: *Applied Surface Science*

Received Date: 20 November 2017  
Revised Date: 4 April 2018  
Accepted Date: 9 April 2018

Please cite this article as: T-C. Chen, T-C. Yang, H-E. Cheng, I-S. Yu, Z-P. Yang, Single Material TiO<sub>2</sub> Thin Film by Atomic Layer Deposition for Antireflection and Surface Passivation Applications on P-Type C-Si, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.04.078>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Single Material TiO<sub>2</sub> Thin Film by Atomic Layer Deposition for Antireflection and Surface Passivation Applications on P-Type C-Si

Tsung-Cheng Chen<sup>a+</sup>, Tsuo-Chuan Yang<sup>a+</sup>, Hsyi-En Cheng<sup>b</sup>, Ing-Song Yu<sup>c</sup>, Zu-Po Yang<sup>a</sup>

<sup>a</sup> *Institute of Photonic System, National Chiao Tung University, Tainan 71150, Taiwan*

<sup>b</sup> *Department of Electro-Optical Engineering, Southern Taiwan University of Science and Technology, Tainan, 710, Taiwan*

<sup>c</sup> *Department of Materials Science and Engineering, National Dong Hwa University, Hualien 97401, Taiwan*

<sup>+</sup> *Equal contribution*

To whom to correspond:

[zupoyang@nctu.edu.tw](mailto:zupoyang@nctu.edu.tw); Fax: 886-6-3032535; Tel: 886-6-3032121-57762

[bobchen.cop05g@nctu.edu.tw](mailto:bobchen.cop05g@nctu.edu.tw); Fax: 886-6-3032535; Tel: 886-929-903-388

## Abstract

A thin film deposited on the front surface of solar cell plays an important role in reducing the reflection of incident light and providing surface passivation. Although ultrathin TiO<sub>2</sub> films have shown excellent performance of surface passivation, simultaneously serving both functions is hindered by the crystallization issue, which can degrade the passivation quality of TiO<sub>2</sub> film, as the film thickness is over certain value (few nanometer only). Here we showed that both functions can be satisfied by single material of titanium oxide film through atomic layer deposition at low temperatures. By varying deposition temperatures from 80 to 200 °C, the TiO<sub>2</sub> film deposited at 80 °C can maintain its amorphous phase up to the thickness of 114 nm. In addition, the optimal thickness for antireflection calculated by OPAL 2 is 61 nm, meaning that amorphous TiO<sub>2</sub> film to provide antireflection and surface passivation can be achieved. The passivation quality is verified by minority carrier lifetime measurement using photo-conductance decay method and presented the ultralow surface recombination velocity of 8.7 cm/s. Furthermore, the passivation mechanism

Download English Version:

<https://daneshyari.com/en/article/7833445>

Download Persian Version:

<https://daneshyari.com/article/7833445>

[Daneshyari.com](https://daneshyari.com)