The improvement of solar cells performance by optimized boron doped nc-Si:H/a-SiC:H superlattice window layer

Jun Ma, Yujie Yuan, Zhengchun Yang, Kailiang Zhang

PII: S0257-8972(16)31193-8
DOI: doi: 10.1016/j.surfcoat.2016.11.061
Reference: SCT 21807

To appear in: *Surface & Coatings Technology*

Received date: 31 August 2016
Revised date: 8 November 2016
Accepted date: 16 November 2016

Please cite this article as: Jun Ma, Yujie Yuan, Zhengchun Yang, Kailiang Zhang, The improvement of solar cells performance by optimized boron doped nc-Si:H/a-SiC:H superlattice window layer, *Surface & Coatings Technology* (2016), doi: 10.1016/j.surfcoat.2016.11.061

The improvement of solar cells performance by optimized boron doped nc-Si:H/a-SiC:H superlattice window layer

*Jun Ma, Yujie Yuan, Zhengchun Yang, Kailiang Zhang**

School of Electronic Information Engineering, Tianjin Key Laboratory of Film Electronic & Communication Devices, Tianjin University of Technology, Tianjin 300384, China

Abstract

The ideal window layer of silicon thin film solar cells should serve a number of functions, such as high transparency, high conductivity and anti-reflection nature. In this paper, we reported a p-type nc-Si:H/a-SiC:H quantum dot superlattice (QDSLs) films prepared by plasma enhanced chemical vapor deposition (PECVD) at 150^{o}C. High resolution transmission electron microscopy investigations and PL spectra confirmed the superlattice structure of silicon quantum dots separated by a-SiC:H matrix. This simple and efficient method for fabricating QDSLs allows independent control of the characteristics of the potential well and potential barrier. Both the simulation and experiment results show that high transparency and anti-reflection are simultaneously obtained in the QDSLs films with appropriate compositional fraction and crystalline fraction. Applying the optimized nc-Si:H/a-SiC:H QDSLs window layer, a significant improvement of open circuit voltage and short circuit current was achieved for amorphous silicon solar cells.

Keywords: Superlattice; Interface passivation; Quantum dots; Amorphous silicon