Post-deposition catalytic-doping of microcrystalline silicon thin layer for application in silicon heterojunction solar cell

Yong Liu, Do Yun Kim, Andreas Lambertz, Kaining Ding

PII: S0040-6090(17)30088-3
DOI: doi: 10.1016/j.tsf.2017.02.003
Reference: TSF 35783

To appear in: *Thin Solid Films*

Received date: 11 October 2016
Revised date: 25 January 2017
Accepted date: 1 February 2017

Please cite this article as: Yong Liu, Do Yun Kim, Andreas Lambertz, Kaining Ding , Post-deposition catalytic-doping of microcrystalline silicon thin layer for application in silicon heterojunction solar cell. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi: 10.1016/j.tsf.2017.02.003

Post-deposition Catalytic-doping of Microcrystalline Silicon Thin Layer for Application in Silicon Heterojunction Solar Cell

Yong Liu*, Do Yun Kim, Andreas Lambertz, Kaining Ding

Forschungszentrum Jülich, IEK5-Photovoltaics, Wilhelm-Johnen-Strasse, 52425 Jülich, Germany

Abstract

The silicon heterojunction (SHJ) solar cell is one of the most promising candidates for the next-generation high-efficiency mainstream photovoltaic technology. It consists of a crystalline silicon wafer coated with a stack of functional thin-films on both sides. Conventionally, intrinsic and doped hydrogenated amorphous silicon (a-Si:H) is used as the passivation layer and emitter or back surface field (BSF), respectively. Hydrogenated microcrystalline silicon (µc-Si:H) is considered as a more advantageous alternative to the a-Si:H emitter and BSF layers due to µc-Si:H's higher electrical conductivity giving rise to lower series resistance. In this contribution, we use the catalytic doping process, so-called "Cat-doping", to post-dope n-µc-Si:H thin-layers in such a way that the conductivity can be increased to higher levels than those achievable in as-grown n-µc-Si:H for the application in SHJ solar cells. We show that the conductivity of the µc-Si:H films notably increases after the Cat-doping. We also investigated the impact of Cat-doping on the conductivity of the different µc-Si:H and on lifetime.

Keywords: Cat-doping; shallow doping; microcrystalline silicon; conductivity; lifetime; heterojunction