Insights into the role of the interface defects density and the bandgap of back surface field for efficient p-type silicon heterojunction solar cells

Fengyou Wang a, Yanbo Gao a, Zhenyu Pang a,b,c, Lili Yang a*, Jinghai Yang a*

a. Key Laboratory of Functional Materials Physics and Chemistry of the Ministry of Education, Jilin Normal University, Siping 136000, China.

b. Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun 130033, China

c. University of the Chinese Academy of Sciences, Beijing 100049, China

*Corresponding Author
Lili Yang, Email address: yanglili1998@126.com
Jinghai Yang, Email address: jhyang1@jlnu.edu.cn
As shown in Fig. S1, it can be observed that the $V_{oc}$ and $FF$ are decreased as the increasing thickness of c-Si wafer. $J_{sc}$ is improved as the increasing thickness of the c-Si wafer. This mainly due to the fact that thicker c-Si wafer will promote the light absorption and series resistance of the devices (as exhibited in Fig S2), which increasing the $J_{sc}$ and declining the $FF$ of the device. In addition, for a constant condition, thicker c-Si indicates that the photo-generated carriers need to diffuse longer path to be collected. This will decrease the built-in field of the p-type SHJ solar cells, which always seriously determining the $V_{oc}$ of the device. As a result, in order to balance the optical and electrical properties, it demonstrates that the c-Si substrates with a thickness of 150-200 μm could be a preferred criterion to p-type SHJ solar cells.

![Fig. S1 The performance of p-type SHJ solar cells as a function of the c-Si thickness](image1)

![Fig. S2 The EQE curves of the p-type SHJ solar cells with various c-Si thickness](image2)