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Study on the ITO work function and hole injection barrier in silicon heterojunction solar cells

Seongho Jeon<sup>1</sup>, Woong-Kyo Oh<sup>1</sup>, Youngseok Lee<sup>1</sup>, Donggi Shin<sup>1</sup>, Geonju Yoon<sup>1</sup>, Sehyeon Kim<sup>1</sup>, and Junsin Yi<sup>1</sup>

<sup>1</sup>Sungkyunkwan University, Korea, Republic of

The change in work function and electron/hole injection barrier is related to the band alignment. The high  $\Phi_{\text{ITO}}$  are used to inject holes in front contact barrier ITO/a-Si:H (p) of HIT solar cell, hence as high as possible values of work functions are desired. We focused on the front contact barrier height of HIT (ITO/a-Si:H(p)/a-Si:H(i)/c-Si(n)) solar cell. The ITO films with low resistivity of  $\rho$  were deposited by pulsed DC magnetron sputtering as a function of substrate temperature ( $T_s$ ). There was improvement in  $\Phi_{\text{ITO}}$  from 4.15 to 4.30 eV and variation of hole injection barrier from  $\phi_{\text{h}}$  for the HIT solar cell. The results show that the high values of  $\Phi_{\text{ITO}}$  and the delta hole injection barrier at the front interface of ITO/p-layer lead to an increase of open circuit voltage ( $V_{\text{oc}}$ ), fill factor (FF) and efficiency ( $\eta$ ).