

Studying the Effect of Silicon Substrate Intrinsic Carrier Concentration on Performance of ZnO/Si Solar Cells

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Abstract : Zinc Oxide (ZnO) solar cells have drawn great attention due to the enhanced efficiency and low-cost fabrication process. In this study, ZnO thin film is used as the active layer, hole blocking layer, antireflection coating (ARC) as well as transparent conductive oxide. To improve the conductivity of ZnO, top layer of ZnO is doped with aluminum, for top contact. Intrinsic carrier concentration of silicon substrate plays an important role in enhancing the power conversion efficiency (PCE) of ZnO/Si solar cell. With the increase of intrinsic carrier concentration PCE decreased due to increase in dark current in solar cell. At 80nm ZnO and 160 μ m Silicon substrate thickness, power conversion efficiency of 26.45% and 21.64% is achieved with intrinsic carrier concentration of $1 \times 10^9/\text{cm}^3$, $1.4 \times 10^{10}/\text{cm}^3$ respectively.

Keywords : hetero-junction solar cell, solar cell, substrate intrinsic carrier concentration, ZnO/Si

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