Modeling of Tandem Solar Cell a-Si/a-SiGe using AMPS-1D Program

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Abstract

Modeling of thin-film silicon solar cell requires taking, the electronic structure and opto-electronic properties of the different amorphous layers into account. However, one of the programs which are convivial for this application is AMPS-1D.

In this work, We have performed a Computer modeling of a-Si:H/a-SiGe:H tandem solar cells with p-i-n/p-i-n configuration using AMPS 1D.

Initially, we have investigated the influence of the window layer thickness doped p in the efficiency of the amorphous silicon solar cell used as a top cell; however we have analyzed this effect more particularly in the density of currents and quantum efficiency. Also, we have proved the interest of the choice of a-SiC as window layer instead of a-Si material. Secondly, we have modeled a-SiGe solar cell used as bottom cell in tandem configuration, we have also investigated the problem of the interface between materials constituting the solar cell, especially the interface a-SiC/a-SiGe.

By a suitable choice of the tunnel junction, we have successfully modelled the Tandem a-Si/a-SiGe solar cell, and the simulation results demonstrate the performances boost of the cell comparing to single junction. The results obtained from simulation give a good agreement with experimental results.

Keywords