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Comparison between the Efficiency of Heterojunction Thin Film InGaP\GaAs\Ge and InGaP\GaAs Solar Cell

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Abstract : This paper presents the design parameters for a thin film 3J InGaP/GaAs/Ge solar cell with a simulated maximum efficiency of 32.11% using Tcad Silvaco. Design parameters include the doping concentration, molar fraction, layers’ thickness and tunnel junction characteristics. An initial dual junction InGaP/GaAs model of a previous published heterojunction cell was simulated in Tcad Silvaco to accurately predict solar cell performance. To improve the solar cell’s performance, we have fixed meshing, material properties, models and numerical methods. However, thickness and layer doping concentration were taken as variables. We, first simulate the InGaP\GaAs dual junction cell by changing the doping concentrations and thicknesses which showed an increase in efficiency. Next, a triple junction InGaP/GaAs/Ge cell was modeled by adding a Ge layer to the previous dual junction InGaP/GaAs model with an InGaP /GaAs tunnel junction.

Keywords : heterojunction, modeling, simulation, thin film, Tcad Silvaco
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