

Passive Cooling of Multijunction Concentrator Photovoltaic Solar Cells

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Abstract. Solar concentrator photovoltaic (CPV) is a potential solution to provide renewable energy at higher efficiency and less cost. The elevated temperature of the solar cells due to the accumulated heat leads to a decrease in the electricity generation efficiency of the solar cell. The current study aims to enhance the multijunction (MJ) solar cell electrical conversion efficiency using a passive cooling technique. Three configurations of MJ solar cell modules as follows, a MJ solar cell module without any heat sink, a MJ solar cell module with flat plate fin and a MJ solar cell module with straight fins attached to a flat plate base were simulated using a CFD software. The effects of the ambient temperature have been studied under the constant solar concentration of 50 suns and wind speed of 1 m/s. The results showed that using a heat sink decreases the maximum solar cell temperature by 43.9% and 50.68% and consequently increases the solar cell efficiency by 4.08% and 4.68% in case of flat plate Fin and straight fins attached to a flat plate base respectively compared to the solar cell without any heat sink.