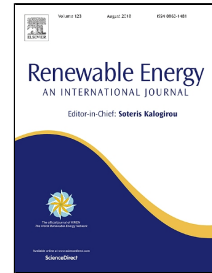


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Conversion Efficiency Gain for Concentrated Triple-Junction Solar Cell System through Thermal Management

Dianhong Li, Yimin Xuan, Ershuai Yin, Qiang Li



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1 **Conversion Efficiency Gain for Concentrated Triple-Junction Solar** 2 **Cell System through Thermal Management**

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9 **Abstract**

10 The application of the thermoelectric (TE) modules can provide extra power in PV cell
11 systems, but the increased thermal resistance leads to an increase in the temperature of the PV
12 cells. In this paper, the phase change materials (PCMs) attached to the back side of the PV cell is
13 used to control the temperature of the PV cells. The PCMs transfers the heat absorbed from the PV
14 cell to the TE modules. A comprehensive experimental study is carried out to investigate the
15 performance of the photovoltaic-thermoelectric hybrid system with PCMs. The outdoor tests are
16 performed to reveal the influence of the cooling methods, the sunlight intensity, and the
17 uniformity of the concentrated light spot on the conversion efficiency of the system. The results
18 indicate that the conversion efficiency of the PV-TE hybrid system with PCMs is 0.56 % more
19 than solo PV cell system due to a decrease of the PV cell temperature and the efficiency
20 contribution of the TE modules. This work investigates the factors that affect the full spectrum
21 utilization of solar energy in PV cell systems.

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24 **Keywords:** Photovoltaic; Thermoelectric; Phase change material; Triple-junction solar cells

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