

Use of PCM with Aluminum Fins to Improve Solar Panel Performance

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Abstract

In photovoltaic (PV) cells, a large part of the solar radiation turns into heat that increases its temperature and reduces its efficiency. In order to reduce the loss of power due to temperature increment, a system which is phase change material (PCM) with aluminum fins (PV-PCM/Aluminum) has been developed. In this study, aluminum fins were used to increase the transferring heat with PCM to absorb heat energy from photovoltaic panels. This method is a passive cooling method that regulates the temperature of the PV panel in hot climatic conditions. RT28HC was used as PCM to regulate PV panel surface temperature. In order to regulate the temperature of PV cells and increase the electrical performance of photovoltaic panels, the usual PV panel was compared using PCM with flat aluminum fins (MODULE A) and PCM with perforated aluminum fins (MODULE B).

The experiments were conducted in a laboratory for 60 minutes at 20 °C as the starting temperature. Experimental results indicate that the average PV panel surface temperature decreased by 16,9% from 49,24 °C to 40,92 °C (MODULE A) and 17,37% decreased from 49,24 °C to 40,69 °C (MODULE B). With the decrease in the PV panel surface temperature, the electrical features of the PV panel were measured and maximum power generation increased by 7,43% compared to usual PV panel from 1,48 W to 1,59 W (MODULE A) and 9,46 % from 1,48 W to 1,62 W (MODULE B). Results are presented in graphical form of time-dependent surface temperature, current, voltage, and power of PV panels.

Keywords: *Phase Change Material (PCM), aluminum fin, potovoltaic, thermal management*