

Performance Comparison of the Standard Photovoltaic Thermal Collector (PVT) and Photovoltaic Thermal Collector with Phase Change Materials (PVT-PCM)

ABSTRACT

The purpose of this study is to evaluate the thermal and electrical efficiency of PVT-PCM and PVT for photovoltaic thermal collectors. A square absorber tube with PCM was utilized in the study, introducing a new approach to photovoltaic thermal collectors. COMSOL computational fluid dynamics (CFD) software was employed to carry out the simulations, and the tests were conducted as indoor experiments in a lab. Water was used as the transmission fluid in this study. Different volume flow rates ranging from 1–3 LPM were assessed for both experiment and simulation by considering the radiation range of 400, 600, and 800W/m². At a volume flow rate of 2 LPM, experimental results showed that PVT-PCM achieved higher electrical and thermal efficiencies of 9.95% and 88.3%, respectively, compared to the simulation results of 10.0% and 86.5%. Comparable outcomes were seen with both the simulation and experiment.