Enhancement of the Electrical Yield of Silicon Solar Panels through Cooling by MgO and ZnO Nanofluids at Different Volume Concentrations

Muhammad Ibrahim Abdulhamid

Department of Physics, Faculty of Science, Tanta University, Egypt
muhammad.ibrahim@science.tanta.edu.eg

Solar panel overheating is a major contributor to conversion efficiency reduction. Hence, cooling down the solar panels is a key strategy for enhancing their electrical output of it as a matter of controlling their thermal properties. This study is set out to examine, experimentally, the back passive cooling effect of MgO and ZnO water-based nanofluids at volume concentrations of 0.01%, 0.03%, and 0.05% on the thermal and electrical characteristics of polycrystalline silicon solar panels, compared with not cooled and with water-cooled panels. The system design is costly-effective and mainly facilitates the direct contact of the fluids to the back of the PV system. From the experimental results, the MgO nanofluid introduced better improvement contrasted to the ZnO nanofluid and the water cooling. The electrical efficiency enhancement reached its maximum at a volume concentration of 0.05% with 20.903% and 21.649% for MgO and ZnO nanofluids, respectively over the not cooled panel. At this volume concentration, the temperature reduction of MgO nanofluid introduced 20.717%, while it is 15.804% for the ZnO nanofluid above the reference panel.