Improvement in the performance of solar collectors with nanofluids — a state-of-the-art review

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ABSTRACT

The upward energy demand along with the depletion of conventional energy sources demands improved utilization of renewable energy resources. Among many energy resources, solar energy is the most appropriate alternative to conventional energy sources owing to its inexhaustibility and green property. Solar collectors are the devices which convert the solar radiation into heat or energy. Solar collector's efficiency should be improved by nanofluids. The importance and significance of nanofluid on the performance of solar collectors especially on thermal properties are extensively described here. Six types of solar collector's viz. flat plate, evacuated tube, direct absorber, parabolic trough, solar dish, and photovoltaic thermal solar collector performance has been extensively reviewed here. The nanomaterials such as TiO_2, CuO, ZnO, Al_2O_3, and MWCNTS in base fluids with polymer dispersant or surfactants forming nanofluids for the mentioned types of solar collectors are compiled. Further, the quantification of the improvement in solar collector performance utilizing these nanofluids as working fluid is compiled. Recent problems of these nanofluids performance in the solar collectors are included and a future recommendation of research based on these problems is also covered.

KEYWORDS

Solar collector; Nanofluids; Thermal conductivity; Outlet temperature