

## Documents

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**Numerical analysis for thermal performance of a photovoltaic thermal solar collector with SiO<sub>2</sub>-water nanofluid**

(2018) *Applied Sciences (Switzerland)*, 8 (11), art. no. 2223, . Cited 5 times.

**Abstract**

Numerical analysis of a photovoltaic-thermal (PV/T) unit with SiO<sub>2</sub>-water nanofluid was performed. The coupled heat conduction equations within the layers and convective heat transfer equations within the channel of the module were solved by using the finite volume method. Effects of various particle shapes, solid volume fractions, water inlet temperature, solar irradiation and wind speed on the thermal and PV efficiency of the unit were analyzed. Correlation for the efficiencies were obtained by using radial basis function neural networks. Cylindrical shape particles were found to give best performance in terms of efficiency enhancements. Total efficiency enhances by about 7.39% at the highest volume fraction with cylindrical shape particles. Cylindrical shape particle gives 3.95% more enhancement as compared to spherical ones for the highest value of solid particle volume fraction. Thermal and total efficiency enhance for higher values of solid particle volume fraction, solar irradiation and lower values of convective heat transfer coefficient and inlet temperature. The performance characteristics of solar PV-thermal unit with radial basis function artificial neural network are found to be in excellent agreement with the results obtained from computational fluid dynamics modeling. © 2018 by the authors.

2-s2.0-85056543163

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

**Access Type:** Open Access