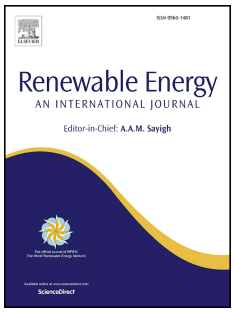
Accepted Manuscript



Effects of porous material and nanoparticles on the thermal performance of a flat plate solar collector: An experimental study

H. Javaniyan Jouybari, S. Saedodin, A. Zamzamian, M. Eshagh Nimvari, S. Wongwises

PII: S0960-1481(17)30620-1

DOI: 10.1016/j.renene.2017.07.008

Reference: RENE 8983

To appear in: *Renewable Energy*

Received Date: 6 May 2017

Revised Date: 28 June 2017

Accepted Date: 3 July 2017

Please cite this article as: Jouybari HJ, Saedodin S, Zamzamian A, Nimvari ME, Wongwises S, Effects of porous material and nanoparticles on the thermal performance of a flat plate solar collector: An experimental study, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.07.008.

Effects of porous material and nanoparticles on the thermal performance of a flat plate solar collector: An experimental study

H. Javaniyan Jouybari[1], S. Saedodin[1*], A. Zamzamian[2*], M. Eshagh Nimvari[3], S. Wongwises[4,5]

[1] *Department of Mechanical Engineering, Semnan University, Semnan, Iran*

[2] *Solar Energy Group, Energy Department, Materials and Energy Research Center (MERC), Karaj, Iran*

[3] *Faculty of Engineering, Amol University of Special Modern Technologies, Amol, Iran*

[4] *Fluid Mechanics, Thermal Engineering and Multiphase Flow Research Lab. (FUTURE), Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangmod, Bangkok 10140, Thailand*

[5] *The Academy of Science, The Royal Institute of Thailand, Sanam Suea Pa, Dusit, Bangkok 10300, Thailand*

Abstract:

The thermal performance of a nanofluid flow through a flat plate solar collector with the metal porous foam filled channel is experimentally investigated. For this purpose, the SiO_2/deionized water nanofluids are prepared with volume fractions of 0.2%, 0.4% and 0.6% then their thermal behavior is examined on the porous channel collector based on the ASHRAE standard. Based on the experimental results, the thermal efficiency is improved up to 8.1% in the nanofluid flow. Using the porous media and nanofluid causes an undesirable increase in the pressure drop. To take both the heat transfer enhancement and pressure drop into consideration, a Performance Evaluation Criterion (PEC) has been used for nanofluid and porous media, separately. It is observed that as the nanoparticle volume fraction increases from 0.2% to 0.6%, the performance of nanofluid flow, PEC_{nf}, is enhanced from 1.07 to 1.34 in the lowest flow rate (0.5 lit/min). Also, the performance evaluation of the porous media, PEC_{p}, shows that the solar collector

* Corresponding authors.
E-mail address: S_sadodin@semnan.ac.ir , azamzamian@merc.ac.ir, Tel./fax: +98 23 33325630