Case Studies in Thermal Engineering 3 (2014) 59–67

Contents lists available at ScienceDirect

Case Studies in Thermal Engineering

journal homepage: www.elsevier.com/locate/csite

Heat transfer augmentation in the straight channel by using nanofluids

M.Kh. Abdolbaqi [a,*], C.S.N. Azwadi [b], R. Mamat [a]

[a] Faculty of Mechanical Engineering, 26600 Pekan, Pahang, University Malaysia Pahang, Malaysia
[b] Faculty of Mechanical Engineering, 81200 Skudai, Johor Bahru, Universiti Teknologi Malaysia, Malaysia

ARTICLE INFO

Article history:
Received 29 March 2014
Received in revised form
16 April 2014
Accepted 17 April 2014
Available online 24 April 2014

Keywords:
Nanofluid
Heat transfer
Straight channel
CFD
FLUENT

ABSTRACT

Heat transfer enhancement of nanofluids under turbulent flow through a straight square channel under constant heat flux conditions at the upper and lower walls is studied numerically. The nanofluids are prepared as solid nanoparticles of CuO, TiO_2 and Al_2O_3 suspended in water. CFD analysis by FLUENT software using the finite volume method is conducted. The boundary conditions are applied under a heat flux of 5000 W/m^2, Reynolds numbers of 10^4–10^6 and a constant volume concentration of 1–4%. The results show that the heat transfer rates and wall shear stress increase with an increase of the nanofluids' volume concentration. It seems that the CuO nanofluid significantly enhances heat transfer. The results show good agreement with results of other researchers by a 10% deviation.

* Corresponding author.
E-mail address: abdolbaqi.mk@gmail.com (M.Kh. Abdolbaqi).

http://dx.doi.org/10.1016/j.csite.2014.04.001
2214-157X/