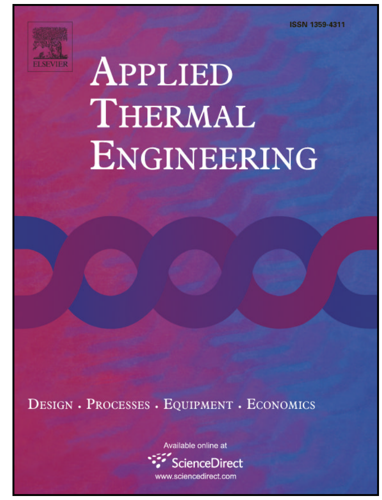
Accepted Manuscript



An experimental study on heat transfer and pressure drop of water/graphene oxide nanofluid in a copper tube under air cross-flow: Applicable as a heat exchanger

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PII: S1359-4311(17)31028-1
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2017.06.110
Reference: ATE 10629

To appear in: *Applied Thermal Engineering*

Received Date: 14 February 2017
Revised Date: 10 June 2017
Accepted Date: 21 June 2017

Please cite this article as: R. Ranjbarzadeh, A.H. Meghdadi Isfahani, M. Afrand, A. Karimipour, M. Hojaji, An experimental study on heat transfer and pressure drop of water/graphene oxide nanofluid in a copper tube under air cross-flow: Applicable as a heat exchanger, *Applied Thermal Engineering* (2017), doi: http://dx.doi.org/10.1016/j.applthermaleng.2017.06.110

An experimental study on heat transfer and pressure drop of water/graphene oxide nanofluid in a copper tube under air cross-flow: Applicable as a heat exchanger

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Abstract

The effect of using water/graphene oxide nanofluid as a working fluid on heat transfer and pressure drop was studied experimentally. For this purpose, subsonic wind tunnel and a closed heat transfer cycle were used at the same time. The effect of different concentrations (0, 0.05, 0.1, 0.2% by volume) of water/graphene oxide nanofluid at different Reynolds numbers in a tube under air cross-flow was evaluated in wind tunnel tests. The range of Reynolds number of the flow around the tube was $3800 \le \mathrm{Re}_o \le 21500$. The friction factor of the nanofluid flow inside the tube and the mean Nusselt number of the external air flow around the copper tube were calculated by measuring the variables. Results showed that by using water/graphene oxide nanofluid, the average Nusselt number enhanced by up to 51.4% compared to pure water. The use of nanofluid increased the friction factor by 21% in comparison with pure water. Because of changes in heat transfer and friction factor, heat transfer performance coefficient increased by up to 42.2%, indicating enhanced heat transfer compared to undesirable pressure drop in the test. According to the results, this nanofluid can be a good alternative in similar applications such as heat exchangers.

Keywords: Experimental study; Air cross-flow heat transfer; Water/graphene oxide nanofluid; Pressure drop; Copper tube;