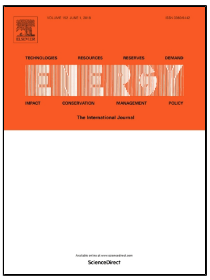
Accepted Manuscript



Do nanofluids affect the future of heat transfer?"A benchmark study on the efficiency of nanofluids"

Ali Alirezaie, Mohammad Hadi Hajmohammad, Ali Alipour

PII:	S0360-5442(18)30880-6
DOI:	10.1016/j.energy.2018.05.060
Reference:	EGY 12895
To appear in:	*Energy*
Received Date:	26 December 2017
Accepted Date:	08 May 2018

Please cite this article as: Ali Alirezaie, Mohammad Hadi Hajmohammad, Ali Alipour, Do nanofluids affect the future of heat transfer?"A benchmark study on the efficiency of nanofluids", *Energy* (2018), doi: 10.1016/j.energy.2018.05.060

Do nanofluids affect the future of heat transfer? "A benchmark study on the efficiency of nanofluids"

Ali Alirezaie[a1], Mohammad Hadi Hajmohammad[b], Ali Alipour[c]

[a]Department of Mechanical Engineeering, Semnan University, Semnan, Iran
[b]Department of Mechanical Engineering, Imam Hossein University, Tehran, Iran
[c]Mechanical Engineering Department, K. N. Toosi University of Technology, Tehran, Iran

Abstract

In this research, the thermal performance and economic efficiency of nanofluids are investigated. Considering that the economic justification is the most important factor for the survival of industry and the advancement of invention, price-performance analysis is examined using empirical data. What initially led to the development of research of the heat transfer of nanofluids was reports of anomalous increase in the thermal properties of fluids containing nanoparticles. Abundant need for introducing solutions to increase the heat transfer rate in cooling systems attracted many researchers. After two decades of research on this phenomenon, it is time to investigate whether nanofluids have been able to meet the expectations of heat transfer researchers and create a massive transformation in the field of heat transfer or not? Whether or not the nanofluids, as claimed, would increase efficiency and reduce costs? And finally, will nanofluids acquire a share of the fluid market of heat transfer in the near future? In this research, experimental data of efficiency of different nanofluids (aqueous Ag, MgO, MWCNT and DWCNT) is reviewed and efficiency-price index is presented. Afterward, these informations are compared according to the price of nanofluids and specifying the most efficient nanofluid. Economic analysis of heat transfer of nanofluids indicated that nanofluids don't have economic justification except in high-tech devices with critical applications.

Keywords: heat transfer, nanofluid, CNT, economic efficiency, thermal performance, convection

1.1. Introduction

For over twenty years, it has been introduced heat transfer media containing nanoparticles. Immediately after the publication of the first paper in this area, the researchers focused on the issue of nanofluid heat transfer, which led to an increasing number of research in this area. If we look at the statistics of the articles during this period, it can be seen that a great number of papers are published. Research from universities and research centers around the world that has studied and evaluated various nanofluids in a variety of contexts and has examined the effects of various factors on heat transfer, thermal conductivity, viscosity, boiling heat transfer. Millions or billions of dollars of research funding has been spent in this field, but this research is still ongoing. Different applications for nanofluids were considered, and each field examined the conditions for nanoparticles to improve expected performance. But, nanofluids have not yet been able to find a way to enter the business. Large expenditures for research are

[1] Corresponding author, Email: Ali.alirezaei68@gmail.com