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*Abstract*

# Experimental Studies of the Sedimentation, Stability and Thermal Conductivity of Two Different Nanofluids †

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**Abstract:** Fluids containing nanometer-sized particles (nanofluids, NFs) are potential candidates to improve the performance and efficiency of several thermal devices at micro- and macro-scale levels. However, the problem of sedimentation and instability of these colloidal dispersions has been the biggest obstacle for industrial-scale applications. In this work, two different NFs were tested using distilled water (DI-Water) as the base fluid. The first is a traditional NF formed by $Al_2O_3$ nanoparticles (NPs) with 50 nm diameter, and the second is a novel NF formed by poly (acrylic acid)-coated iron oxide NPs ($Fe_3O_4$@PAA) with ~10 nm diameter, obtained through a hydrothermal synthesis process. The main objective of this study was to evaluate the colloidal stability of these NFs over time using different volume fractions and compare it with DI-Water. Results involving sedimentation studies and zeta potential measurements showed that the proposed $Fe_3O_4$@PAA NF presents a higher colloidal stability compared to that of the $Al_2O_3$ NF. Additionally, thermal conductivity measurements were performed in both $Fe_3O_4$@PAA and $Al_2O_3$ NFs at different NP concentrations, using the transient plane source technique. Results showed higher thermal conductivity values for the $Fe_3O_4$@PAA NFs compared to those of $Al_2O_3$ NFs. However, a linear enhancement of thermal conductivity with increasing NPs concentration was observed for the $Al_2O_3$ NF over the whole range of NP concentrations tested, whereas two different regimes were observed for the $Fe_3O_4$@PAA NF.

**Keywords:** nanofluids; zeta potential; stability; thermal conductivity

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