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Synthesis and physicochemical characterization of aqueous nanofluids (ZnO/H_2O and $ZnO\text{-}Ag/H_2O$) for microscale heat transfer application

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Nanofluids have been influential in the last decade due to their involvement in the miniaturization of micro-scale electronic devices as heat transfer fluids for their optimization [1-2]. A diverse range of nanofluids has been applied and synthesized based on different materials and base fluids, enabling their development in this field. However, nanofluids made of metal oxides have favourable characteristics; for example, zinc oxide (ZnO) has stood out as a compound with interesting catalytic, electrical, electronic, optical, antimicrobial and thermal properties. This last characteristic stands out since the composite ZnO can reach high thermal conductivity values of 1.02 -1.16 (W/cm K) [3-4]. In this study, aqueous nanofluids based on zinc oxide (ZnO) doped in silver (Ag) have been prepared, where a hybrid nanofluid was obtained by the two-step method at different ZnO concentrations; 0.1; 0.5 and 1% wt, keeping a fixed Ag concentration of 0.63% wt. In addition, ZnO nanofluids were synthesized in the aqueous base at different concentrations, 0.1, 0.5 and 1 % wt, where a physicochemical characterization study was carried out through UV-VIS analysis where the stability of the nanofluids could be evidenced and a TEM analysis to demonstrate the doping of the hybrid nanofluid. Subsequently, a thermal conductivity study was carried out, which showed an increase of 9.31% for the ZnO/H_2O nanofluid and 10.51% for the $ZnO\text{-}Ag/H_2O$ nanofluid concerning the thermal conductivity of water. This gives promising characteristics in the application of microchannels for heat dissipation.

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