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Adding tungsten oxide-MWCNTs-silica ternary nanopowders to water-ethylene glycol hybrid base fluid to investigate the rheological behavior of a created nanocolloid

Ajout de nanopoudres ternaires d'oxyde de tungstène-MWCNT-Silice à un fluide de base hybride à base d'eau-éthylène glycol pour étudier le comportement rhéologique d'un nanocolloïde ainsi créé

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Abstract

Nanofluid rheology and heat transfer were lately the subjects of several research and investigations. In this paper, an experimental investigation was used to investigate the influence of temperature and volume fraction of nanoparticles on dynamic viscosity (μ_{nf}) of WO_3-Multi-Walled Carbon Nanotubes (MWCNT)-SiO_2/ water-EG ternary hybrid nanofluids. The impacts of these factors were also evaluated on mono nanofluids. The nanofluids were made using a two-step process at solid volume fractions of nanoparticles (SVF) of 0.2 to 0.6% and temperatures ranging from T=20 to 60°C. The zeta-potential test was used to measure the stability of nanofluids. According to the obtained results, the nanofluids have high qualities. A Brookfield viscometer was used to measure the μ_{nf}. All volume fractions of nanoparticles show that μ_{nf} decreases with temperature rise. At all temperatures, the μ_{nf} increases as the SVF increase, regardless of temperature. The results showed that in ternary nanofluids the highest amount of viscosity is related to the SVF=0.6% and the T=20°C, which shows a value of 79.7% increase compared to the base fluid at the same temperature. Also, among mono nanofluids, the highest amounts of viscosity were observed for MWCNT at all temperatures and volume fractions. Finally, a mathematical model for calculating the μ_{nf} is established. The results of the proposed models were well correlated with laboratory data. The results of the established model show an acceptable correlation with experimental data.