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Experimental investigation of hybrid nano-lubricant for rheological and thermal engineering applications
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Abstract
Nowadays, various types of engine oils are widely used in lubricating and cooling internal combustion engines. In this study, the behavior of MWCNTs–SiO 2 (30–70)/10W40 hybrid nanofluid as part of a new generation of engine oil is investigated experimentally. A mixture of SiO 2 , with 20–30 nm particle diameter, and MWCNT, with 3–5 nm inner and 5–15 nm outer nanoparticle diameter was dispersed into a base fluid of 10W40 engine oil. Then, the viscosity of the product was measured at nanofluid concentrations and temperatures, respectively, ranging from 0.05 to 1% and 5 to 55 °C, for different values of shear rate. Also, a sensitivity analysis to the solid volume fraction was performed at different temperatures. The results show that the behavior of the samples is well fitted with the pseudo-plastic Ostwald de Waele non-Newtonian model. The viscosity of the produced hybrid nano-lubricant is found to be 35% greater than that of pure engine oil. Because of the significant deviation between the measured viscosity and the values predicted by existing classical viscosity models, a new regression model is obtained. The R 2 and adj. R 2 for the model are computed as 0.988 and 0.977, respectively, signifying strong predictability with ± 3% margin of deviation. © 2019, Akadémiai Kiadó, Budapest, Hungary.

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