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*Non-Newtonian power-law behavior of TiO₂/SAE 50**Nano-lubricant: An experimental report and new correlation*

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Abstract

In the present study rheological behavior of SAE 50w Engine Oil containing TiO₂ nanoparticles of 30 nm is empirically investigated. Various samples of nano-lubricant were made by adding nanoparticles in 0%, 0.125%, 0.25%, 0.5%, 0.75%, 1% and 1.5% solid volume fractions. Dynamic viscosity of the samples was measured in temperature ranges of 25 to 50°C and in various shear rates. The results clearly showed that the nano-lubricant as well as the base oil were non-Newtonian fluids behaving as power-law equation. From the values of power law index it was revealed that the nano-lubricant exhibited shear thinning behavior, though in high solid volume fractions it tends to Newtonian behavior. With using viscosity data, a new correlation is proposed in terms of temperature and solid volume fraction which has R-squared values of 0.9751. Margins of deviation for experimental data prediction were less than 1.52%. Nano-lubricant was studied to determine its sensitivity to adding a specific extra amount of nanoparticles. It was revealed by the results that the nano-lubricant is more sensitive to solid volume

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