Effect Tio_2 Nanoparticles on the Thermal Properties of Engine Oil: an Experimental Investigation

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Metal oxide nanoparticles have a significant impact on the properties of nanofluids and among all metal oxides Titanium dioxide (TiO_2) has attracted research attention due to its remarkable properties. Where the TiO_2-added nanofluids enhance the thermal properties of engine oil thereby enhancing the engine performance. In this experimental work, pure base engine oil 10W30 was improved with TiO_2 nanoparticles with different concentrations. Then thermal properties such as thermal conductivity, specific heat capacity, and flash point values were measured at the temperature range of 30-120 ℃. The Scanning Electron Microscope (SEM) images proved that the particle size of the TiO_2 nanoparticle size ranged from 30 to 60 nm and, the nanomaterials were anatase-type. The thermal conductivity was measured using a FLUCON Lambda thermal conductivity meter while the flash point was measured using an Anton Paar 500 flash point tester. The two-step method was used to prepare the nanofluids with two different volume fractions of TiO_2 and samples were stirred and sonicated at particular temperature values to obtain well-dispersed nanofluid. To prevent aggregation and to gain better stability the CTAB was added at volume ratio 0.05% as a surfactant for the nanofluids. The thermal conductivity of both nanofluids and base fluid decreased linearly when increasing the temperature, but nanofluids thermal conductivity demonstrated a significant enhancement when compared with base fluid. The Flash point of nanofluids illustrated that they are also increased considerably when compared with engine oil and both thermal properties are enhanced when increasing the volume ratio of nanoparticle.

Keywords: *Engine oil, Flash point, Thermal conductivity, TiO_2*