

## VISCOSITY DATA of $Al_2O_3$ /WATER AND $Al_2O_3$ / (EG/WATER) MIXTURE NANOFLUIDS AND THE HYSTERESIS PHENOMENON

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**Abstract:** The effects of temperature and low particle volume concentration on the dynamic viscosity of the  $Al_2O_3$ /water and  $Al_2O_3$ /EG/water-based nanofluids are investigated. Measurements of the nanofluid viscosities were accomplished using Brookfield viscometer (DV-II + Pro Programmable Viscometer) with a temperature controlled bath, supplied by Brookfield engineering laboratories of Malaysia. Viscosity of the studied nanofluids are strongly depended on the  $Al_2O_3$  particle volume fractions in the base fluid. Data were collected for temperatures ranging from 25 to 80 °C. The presence of aggregated  $Al_2O_3$  nanoparticles in the fluid, with average diameter of 109nm, which is ~8 times the primary diameter (13nm) of  $Al_2O_3$  nanoparticles, have been confirmed by Dynamic Light Scattering (DLS) data. The results clearly showed the presence of a critical temperature, beyond which the particle suspension properties were noticed to be radically changed, which results in activating the hysteresis phenomenon. The hysteresis phenomenon on viscosity measurement, which is believed to be the first observed for EG/water-based nanofluids, has raised serious concerns regarding the use of nanofluids for heat transfer enhancement purposes.