Magneto-rheological and thermal transport characteristics of a transformer oil based ferrofluid

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Ferrofluids constitute a potential substitute of liquid dielectric in high voltage technologies. Hence, the flow and thermal transport characteristics of a ferrofluid based on transformer oil were investigated. The magneto-rheological behavior of the ferrofluid was studied in the shear rate range from 1 to 1000/s and magnetic field up to 1 T. The thermal conductivity, specific heat and thermal diffusivity were obtained for the studied oil and ferrofluid. The Newtonian character of the ferrofluid changed to a non-Newtonian by application of the magnetic field. The magneto-viscous effect has been observed at low shear rates. Doping of the oil by 3 wt% of the nanoparticles resulted in enhancement of the thermal conductivity by about 3.2 %.