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Thermal conductivity of water based magnetite ferrofluids at different temperature for heat transfer applications (Conference Paper)

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Abstract

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Magnetic magnetite , Fe_3O_4 nanoparticles produced by Massart's procedure were used to prepare water based magnetite , Fe_3O_4 ferrofluids without addition of any stabilizing agent or surfactant. The thermal properties and suspension stabilization of the ferrofluids were investigated by varying the magnetite , Fe_3O_4 nanoparticles concentration in the ferrofluids prepared. The thermal conductivity of water based ferrofluids prepared using five different volume fraction of magnetite , Fe_3O_4 suspension (0.1, 0.05, 0.02, 0.01 and 0.005) were measured at five different temperature , 25°C, 30°C, 40°C, 50°C and 60°C in order to evaluate its potential application as heat transfer fluid. The results shows that the thermal conductivity of the ferrofluids are higher than the base fluid, and the thermal conductivity of the ferrofluids increased as the magnetite concentration in the ferrofluids decreased however reached its optimum for ferrofluids prepared using 0.01 volume fraction of magnetite suspension over 0.99 volume fraction of water . Accordingly, the thermal conductivity of the ferrofluids significantly increased as the temperature increased where 49.4% enhancement with respect to water were observed at temperature 60°C.

SciVal Topic Prominence

Topic: hyperthermia | Hyperthermia therapy | fluid hyperthermia

Prominence percentile: 99.493

Author keywords

Ferrofluids | Magnetic materials | Magnetite | Nanoparticles | Thermal conductivity

Indexed keywords

Engineering controlled terms: Heat transfer | Iron oxides | Magnetic fluids | Magnetic materials | Magnetite | Magnetite nanoparticles | Nanomagnetics | Nanoparticles | Suspensions (fluids) | Thermal conductivity | Volume fraction

Engineering uncontrolled terms: Fe3O4 nanoparticles | Heat transfer applications | Magnetite concentration | Magnetite suspensions | S-procedures | Stabilizing agents | Water based

Engineering main heading: Thermal conductivity of liquids

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