A Brief Study on Nanofluid

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Abstract

A nanofluid is a fluid containing nanometer-sized particles, called nanoparticles. The nanoparticles used in nanofluids are typically made of metals, oxides, carbides, or carbon nanotubes. Common base fluids include water, ethylene glycol and oil.Nanofluid is prepared by suspending a small quantity of nanoparticles in base fluids such as water, ethylene glycol etc. with or without stabilization techniques. The average size of nanoparticles is below 100 nm.Experimental results reveal that the maximum and minimum density of the nanofluid is measured at 1058 kg/m3 at 25ºC temperature with 1.50% particle volume concentration and 1001 kg/m3 at 50ºC temperature with 0.25% nanoparticle volume concentration for CuO/PG + water nanofluid respectively.Nanofluids are primarily used for their enhanced thermal properties as coolants in heat transfer equipment such as heat exchangers, electronic cooling system(such as flat plate) and radiators.

Keywords: Nanofluid, Heat transfer fluid, Nanofluid, Nanocoolant, Nano particles, water- nanofluid

I. Introduction

Incorporation of nanoparticles dramatically improves the thermophysical properties of traditional heat transfer fluid which increase the heat transfer coefficient[1-30]. These thermophysical properties are density, specific heat, thermal conductivity, and dynamic viscosity[31-65]. The degree of enhancement of heat transfer depends on quantity of nanoparticles which is suspended in the base fluid. Metal oxides (Al_2O_3, CuO, TiO_2, ZnO, MgO, SiC etc.) are preferred as nanoparticles which have high thermal conductivity[66-101]. Nitride ceramics (AlN, SiN),carbon ceramics (SiC, TiC) are also used as nanoparticles. Commonly used base fluids are water (H_2O), ethylene glycol (EG), engine oil (EO) etc. Recently, Peyghambarzadeh et al. [102-150] investigated Al_2O_3/water nanofluid in the car radiator and found 45% heat enhancement than pure water. Nguyen et al. [151-198] carried out experiment Al_2O_3/water at 6.8% volume nanoparticle concentration in the radiator type heat exchanger and found 40% increase in heat transfer coefficient. Hwang et al. [199-220] demonstrated that 8% enhancement of heat transfer coefficient was attained for the 3% volume concentration of Al_2O_3/water nanofluid. Chavda et al. [221-234] investigated friction factor CuO/water nanofluid on different pipe and found that friction factor increases when volume concentration of CuO/water nanofluid increases.

II. Methodology

II.A Types of nanofluid

Nanofluids can be classified into four distinct categories based on the type of dispersed particle: (1) metal, (2) metal oxide, (3) carbon, and (4) metal hybrid. These nanoparticles are suspended for the formation of nanofluids in host fluid such as water, ethylene glycol, oils, and methanol.

Fig.1 Types of Nanofluid

II.B What are hybrid nanofluids?

Hybrid nanoparticles are defined as nanoparticles composed by two or more different materials of nanometer size. The fluids prepared with hybrid nanoparticles are known as hybrid nanofluids.

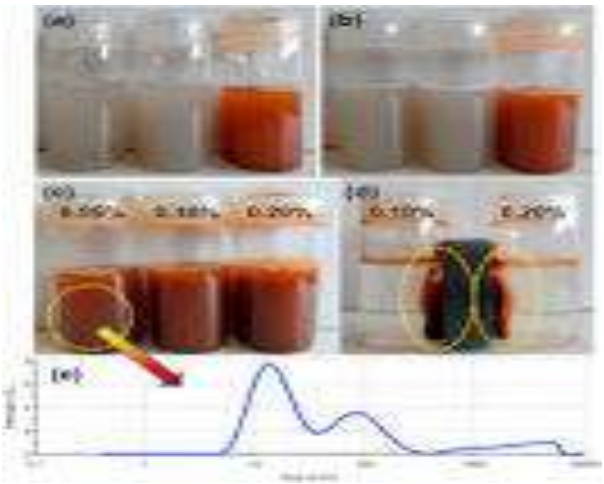

Fig.2 Hybrid Nanofluids

Fig.2 shows the hybrid nanofluids using different materials. It is also shown the color of the hybrid nanofluids different materials.

III. C Synthesis of Nano fluid

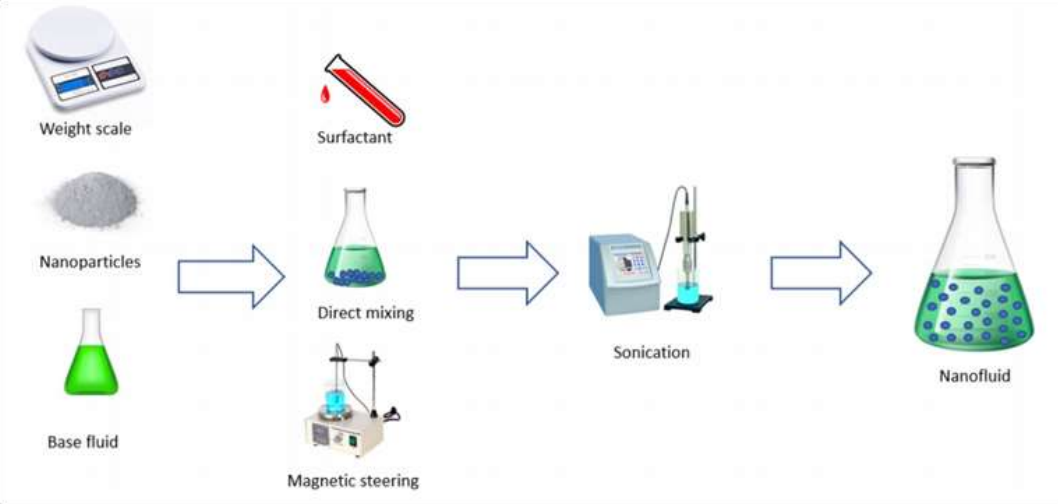

Fig.3 Methods of Nanofluids Synthesis process

Fig.3 shows the 2 steps method of the synthesis of the Nano fluid. It is shown that the NPs, base fluid,magnetic stireer and sonication.

IV. Results and discussion

Thermal conductivity values recorded were very high, with a thermal conductivity of 1.44 W / m k for Ag_2Al–water nanofluid at nanoparticle volume concentration, and a thermal conductivity of 1.35 W / m k for Al_2Cu nanofluid at the same nanoparticle volume concentration. Nano Cool is the only mechanical technology Nanomaterial coolant on the market. Nano Cool utilizes proprietary, nanoscale materials suspended in deionized water to displace heat faster without the performance degradation of traditional products.The battery is located below driver seat in Tata Nano, so for filling distill water, first you would need to remove the sleek metal rods which holds the battery on place, then move the driver seat forward completely, then it will be easy to fill the distill water in it.Nanofluids are primarily used for their enhanced thermal properties as coolants in heat transfer equipment such as heat exchangers, electronic cooling system(such as flat plate) and radiators.The idea behind development of nanofluids is to use them as thermo fluids in heat exchangers for enhancement of heat transfer coefficient and thus to minimize the size of heat transfer equipments. Nanofluids help in conserving heat energy and heat exchanger material.

V. Conclusions

Nanofluids are primarily used for their enhanced thermal properties as coolants in heat transfer equipment such as heat exchangers, electronic cooling system(such as flat plate) and radiators.A Nanofluid is a fluid containing nanometer sized particles. The Nanofluids are obtained by dispersing nanometer sized particles in a conventional base fluids like water, oil, ethylene glycol etc.The Nanofluids are enhanced Thermal Conductivity at very low volume fraction (<0.1%) of the suspended particles.Nano Cool is the only mechanical technology Nanomaterial coolant on the market. Nano Cool utilizes proprietary, nanoscale materials suspended in deionized water to displace heat faster without the performance degradation of traditional products.

Results and discussion

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