P-13: Rheological Properties of Silver Nanofluids Fabricated by Sonochemical Method

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Metal nanostructures with functional properties have been extensively studied recently, since they play important roles in many diverse applications. Among the various metal nanostructures, noble metal nanoparticles (NPs) have attracted considerable attention, due to their unusual optical and chemical properties [1].

Among the different metals studied to date, silver NPs attract special attention due to their high electrical conductivity, antimicrobial effect, oxidative catalytic functions, sensor technology, and unique Raman spectroscopic behavior [2,3].

In this work, the silver NPs were synthesized by sonicating the aqueous solution of sliver nitrate with PVP ascapping agent and soft template agent and sodium borohydride as the reducing agent. The structure, composition, morphology, and magnetic behavior of the NPs were investigated by X-ray diffraction (XRD), transmission electron microscopy (TEM), UV-Vis spectroscopy.

The rheological properties of sliver NPs-ethylene glycol (EG) nanofluids as functions of shear rate, volume fraction, and temperature were measured. The experimental results showed that although the base fluid, EG, acts as a Newtonian fluid, the nanofluid of silver NPs-EG behaves as non-Newtonian fluid at low shear rates. In other words, Newtonian behaviour of EG changes to non-Newtonian for nanofluids because of the interactions between the fluid and NPs. Clearly, as shear rate increases, this effect becomes less marked, suggesting that interactions are relatively weak and broken down at high shear rates. The viscosity of nanofluids increases with increasing the volume fraction of silver NPs. As the volume fraction increases, the number of NPs increases. It causes the fluid becomes less mobilized and hence the viscosity increases.

The temperature dependence of viscosity of nanofluids is reasonably described by Vogel–Fulcher–Tammann (VFT) equation [4,5].

References
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