

Anomalous Temperature Dependence of the Surface Tension in Polyol Process- Synthesized Silver Nanofluids with Higher Alcohols

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Dilute aqueous solutions of higher carbon number (≥ 4) alkyl alcohols have particular properties such that the surface tension increases with temperature. Using these kinds of fluid, named “Self-rewetting fluids” as heat pipe working fluids has led to improvement of heat transfer performance compared to conventional heat pipe working fluids because of the supply of cooling liquid at the dry patch on the heated surface, induced by the positive thermocapillary effect. We reported that the use of aqueous 1-butanolic solution with microwave-synthesized dilute polyvinylpyrrolidone (PVP)-capped silver nanoparticles (Nanofluid) has been shown to be highly effective in improving the heat transport capability of heat pipes. In this study, therefore, the surface tension temperature of the higher alcohols containing PVP-capped Ag nanofluids has been investigated experimentally. The positive surface tension temperature dependencies of the dilute alcohol-containing silver nanofluids were observed and these tendencies were changed by the difference of average molecular weight and molar ratio of silver nanoparticle stabilizer reagent PVP. The enhancements of the positive surface tension gradients with temperature compared to the base aqueous alcoholic solutions were also observed in some particular average molecular weight and molar ratio of PVP-capped Ag nanofluids. In addition, a simple, phenomenological model is discussed, which describes the general trend correctly.