

Thermal stability and conductivity of carbon nanotube nanofluid using xanthan gum as surfactant

ABSTRACT

A nanofluid is a suspension of nano-sized particles dispersed in a base fluid. It is very much obligatory to know more about stability and thermal characteristics of such a nanofluid for their further use in practical applications. In this research, multiwalled carbon nanotubes (CNT) is dispersed in water. CNT dispersed in water is highly unstable and it sediments rapidly due to the Vander Waals force of attraction. Therefore, to overcome this limitation, xanthan gum (XG) was added which behave as a promising dispersant followed by 4 h water bath sonication. Experimental work includes stability studies using UV Vis spectroscopy with respect to CNT concentration (0.01 and 0.1 wt. %) and XG concentration (0.04 and 0.2 wt. %). The thermal conductivity of the most stable suspensions was measured using KD 2 Pro as a function of temperature (25-70°C) and CNT concentration. The optimum XG concentration was found for each CNT concentration studied. Thermal conductivity was observed to be strongly dependent on temperature and CNT concentration. The dispersion state of the CNT-water nanofluid is further examined using scanning electron microscope (SEM). In short, CNT nanofluids are found to be more suitable for heat transfer applications in many industries due to their enhanced thermal conductivity property. This work provides useful insight on the behavior of CNT nanofluids.

Keyword: Carbon nanotubes; Nanofluid; Stability; Thermal conductivity; Xanthan gum