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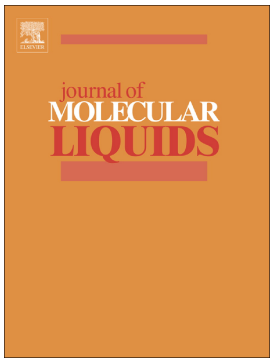

Thermo-physical profile of zinc oxide nanoparticles dispersed in aqueous solution of propylene glycol

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PII: S0167-7322(17)33644-9
DOI: doi:10.1016/j.molliq.2017.11.095
Reference: MOLLIQ 8211

To appear in: *Journal of Molecular Liquids*

Received date: 10 August 2017
Revised date: 5 November 2017
Accepted date: 15 November 2017

Please cite this article as: Mukesh Kumar, Neha Sawhney, Amit Kumar Sharma, Meena Sharma , Thermo-physical profile of zinc oxide nanoparticles dispersed in aqueous solution of propylene glycol. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi:10.1016/j.molliq.2017.11.095

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Thermo-physical profile of zinc oxide nanoparticles dispersed in aqueous solution of propylene glycol

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Abstract

In this investigation zinc oxide (ZnO) nanoparticles were synthesized by precipitation method using $Zn(CH_3COO)_2$ as a starting material. The synthesized nanoparticles were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM) and energy dispersive X- ray spectroscopy (EDX). These nanoparticles were dispersed in 10% aqueous solution of propylene glycol in various concentrations with the help of ultrasonicator to obtain nanofluids of different concentrations. Ultrasonic velocity (u), density (ρ) and viscosity (η) of these nanofluids were measured experimentally as a function of temperatures (T = 303.15 K, 308.15 K and 313.15 K). Using these experimentally measured values various acoustic parameters such as adiabatic compressibility (β_{ad}), intermolecular free length (L_f), relaxation time (τ), acoustic impedance (Z), free volume (V_f) and attenuation coefficient (α/f^2) were evaluated with a view to investigate molecular interactions.

Keywords

ZnO nanoparticles; base fluid; ultrasonic velocity; density; viscosity; acoustic parameters.

1. Introduction

Nanofluid technology is one of the emerging miniaturization techniques which meet the shortcomings of the earlier used bulk fluids and conventional base fluids. The first key step in experimental studies with nanofluids is the preparation of nanofluids. Nanofluids are not simply liquid solid mixtures. For stable suspension, durable suspension and negligible agglomeration of particles, some special requirements are essential. Generally, ultrasonic equipment is used to intensively disperse the particles and reduce the agglomeration of particles.

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