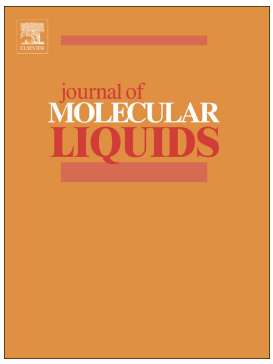

A novel Nanodiamond based IoNanofluid: Experimental and mathematical study of thermal properties

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A novel Nanodiamond based IoNanofluid: Experimental and mathematical study of thermal properties

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A novel IoNanofluid consisting of 1-Butyl-3-methylimidazolium tetrafluoroborate [BMIM][BF_4] as ionic liquid and Nanodiamond (ND with 8 nm size) as nanoparticle was produced and characterized. The ND surface was modified by oleic acid in order to enhance its thermal property and stability in the ionic liquid. The ND dispersion with volumetric percentages of 0.36, 0.69 and 1.04 in the ionic liquid led to thermal conductivity enhancement percentages of 4.2, 5.3 and 9.3, respectively compared to that of the base fluid. The corresponding IoNanofluid viscosity enhancement percentages were 32, 67 and 126, respectively. One of the main factors that contributes to the aforementioned thermal conductivity increases in ionic liquid is the long alkyl chains in the cations of [BMIM][BF_4]. The Eyring theory coupled with the Flory-Huggins (FH) model was used as a thermodynamic model to predict the viscosity, and the results of the proposed model were in satisfactory agreement with the experimental data. The shape, structure, size and characterization of ND as well as IoNanofluid were investigated by the results of XRD, DSC, FTIR, RAMAN, DLS, TEM and SAXS analyses.