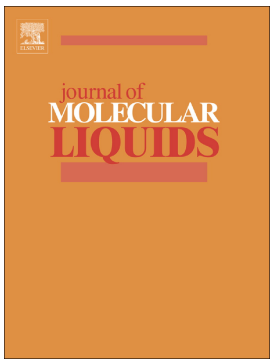

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S. Zeroual, H. Loulijat, E. Achehal, P. Estellé, A. Hasnaoui, S. Ouaskit

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Viscosity of Ar-Cu nanofluids by Molecular Dynamics Simulations: Effects of nanoparticle content, temperature and potential interaction

S. Zeroual[1], H. Loulijat[1], E. Achehal[1], P. Estellé [3], A. Hasnaoui [2], S. Ouaskit [1]

[1] Condensed Matter Physics Laboratory, Faculty of Sciences Ben M'Sik, University Hassan II of Casablanca, B.P. 7955, Casablanca, Morocco

[2] LS3M, Polydisciplinary Faculty of Khouribga, Univ. Hassan 1, B.P. 145, 25000 Khouribga, Morocco

[3] Univ Rennes, LGCGM, EA3913, F-35000 Rennes, France

Abstract

In this study, Molecular Dynamics Simulations is used to calculate the viscosity of Ar-Cu nanofluid within the Green-Kubo framework considering the influence of nanoparticle volume fraction and the nanofluid temperature. First, the simulation method is developed and favourably compared to previous works. Then, simulation results show that the viscosity of Ar-Cu nanofluid is significantly larger compared to that of the Argon base fluid. We also demonstrated that the viscosity of the nanofluid systematically increases with the increase in the particle volume fraction and decreases with increasing temperature. Our results were compared to existing analytical model and previous works involving one common element either Argon or Copper evidencing the role of adjacent liquid layer to a nanoparticle at the solid–liquid interface. Finally, the influence of the solid-solid inter-atomic potential type on the viscosity of nanofluid (Ar-Cu) was finally investigated to evidence the density effect of the ordered liquid layer at liquid-nanoparticle interface.

Keywords: Nanofluid, Molecular Dynamics Simulations, Viscosity, Lennard-Jones potential, Embedded Atomic Method.