

Since the solid nanoparticles with typical length scales of 1-100 nm with high thermal conductivity are suspended in the base fluid (low thermal conductivity), have been shown to enhance effective thermal conductivity and the convective heat transfer coefficient of the base fluid. The thermal conductivity of the particle materials, metallic or nonmetallic such as Al_2O_3 , CuO , Cu , SiO_2 , TiO_2 , are typically order-of-magnitude higher than the base fluids even at low concentrations, result in significant increases in the heat transfer coefficient. Therefore the effective thermal conductivity of nanofluids is expected the enhanced heat transfer compared with conventional heat transfer fluids. Experimental findings that have reported the rate of enhanced heat transfer, in some cases are incoherent. That is because of the fact that in an experiment setup, the results are varied from a test to another. In this research, Eulerian-Lagrangian approach is used to model the dispersion and diffusion of nanoparticles in fluid flow. Navier-Stokes and energy equations for carrier phase in a microchannel are solved and temperature and velocity profiles are evaluated. Newton and energy equation for the dispersed phase are solved in order to obtain the dispersion and heat transfer of nanoparticles. The effect of heat transfer from fluid to particles and from particles to fluid is considered and the incident nanoparticles with the microchannel walls are diffusively reflected. Different forces that affect the dispersion of nanoparticles such as drag force and its proper correction due to nano sized particles, Brownian forces and weight force are considered. Phonon heat transfer in nanoparticles including the interfacial layer is supposed to be the basic mechanism of heat transfer in nanoparticles. The results for the effect of different sizes of nanoparticles and different volume fractions on heat transfer will be presented.

MPA243 Improvement of LIPON Ionic Conductivity to apply as Electrolyte in Solid-State Film Batteries

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Lithium phosphorus oxynitride (LIPON) is known for its application as electrolyte in solid-state batteries, due to high ionic conductivity and high electrical resistivity. Batteries with solid electrolyte can be smaller than conventional ones, have the advantage of prevent the corrosion of materials in contact with electrolyte and are easier to develop due to easier packaging. Electronic properties of LIPON thin-films were measured and correlated with deposition parameters. LIPON was deposited by RF magnetron sputtering technique with a Li_3PO_4 target in a N_2 reactive atmosphere. In order to have a high ionic conductivity and high electrical resistivity, LIPON needs to be as amorphous as possible. Several LIPON films with 1 μm thick were deposited between platinum contact layers. Platinum was chosen to avoid reaction with LIPON and for good electrical conductivity and was deposited by e-beam technique on an aluminum substrate before and after the deposition of LIPON. Ionic conductivity of LIPON was measured using the Nyquist diagram with sinusoidal voltage of 25 mV peak to peak with a range of frequencies of 0,5 Hz to 65 kHz.

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