Chatcharin Sitprasert 2007: A Thermal Conductivity Model for Nanofluids Including Effect of the Temperature-Dependent Interfacial Layer. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Varangrat Juntasaro, Ph.D. 91 pages.

In the development of efficient heat transfer equipment, the thermal conductivity of the heat transfer fluid plays a vital role. Traditional heat transfer fluids such as water, oil and ethylene glycol mixture, are inherently poor heat transfer fluids. So, researchers mix metallic nanoparticles into traditional fluids in order to increase the heat transfer efficiency. These mixtures are called nanofluids. The heat transfer efficiency of nanofluids is increased because the thermal conductivity of the metallic nanoparticles is higher than that of the traditional fluids.

The interfacial layer of nanoparticles has been recently shown to have an effect on the thermal conductivity of nanofluids. There is, however, still no thermal conductivity model that includes the effects of temperature and nanoparticle size variations on the thickness and consequently on the thermal conductivity of the interfacial layer. The present work therefore modifies the thermal conductivity model for nanofluids to include the effect of temperature variation on the thermal conductivity of the interfacial layer for different sizes of nanoparticles. The modified model is evaluated and compared with other thermal conductivity models for the turbulent convective heat transfer in nanofluids along a uniformly heated tube. The present model is more general than other models in the sense, that it can predict both the temperature and the volume fraction dependence of the thermal conductivity of nanofluids for both the non-flowing and the flowing fluid. Also, it is found to be more accurate than the other models due to the inclusion of the effect of the temperature-dependents interfacial layer. In conclusion, the present model can accurately predict the changes in thermal conductivity of nanofluids due to the changes in volume fraction and temperature for various nanoparticle sizes.

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