Thermal Conductivity of Nanofluids Containing Metal Oxide Nanoparticles

Ramvir Singh [C, S], Kamalesh Verma and Anupama Upadhyay
Physics, University of Rajasthan, Jaipur, Rajasthan, India
singhrvs@rediffmail.com

Ravi Agarwal
Centre for Converging Technologies, University of Rajasthan, Jaipur, Rajasthan, India

Fluids contained nanometer sized particles exhibit much greater effective thermal conductivity than predicted by most of the developed relations. Interfacial layer might play a key role on the enhancement of effective thermal conductivity of nanofluids. Water based nanofluid samples were prepared containing metal oxide nanoparticles. Effective thermal conductivity of these samples has been measured by a laboratory made parallel wire technique as a function of weight fraction of filled metal oxide nanoparticles. A model which includes the effect of interfacial layer is proposed here. Besides interfacial layer some additional effects including concentration of nanoparticles, thickness of nanolayer and thermal conductivity of interfacial layer has also been accounted in this paper. Comparison with Maxwell and Renovated Maxwell model shows that our predictions are closer to the experimental results. Artificial Neural Network (ANN) architecture with 4-input and 1-output, in which one of the input is thickness of interfacial layer has also been utilised to predict effective thermal conductivity of nanofluids. Comparison indicates that ANN predictions are better than any other theoretical model.