

Comparison of the Effective Thermophysical Properties of Nanofluids over a Wide Temperature Range

Sergey Rutin and Mars Faizullin

Institute of Thermal Physics, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia

Elena Kalinina and Alexandr Safronov

Institute of Electrophysics, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia

Alexandr Smotritskiy^S and Pavel Skripov^C

Institute of Thermal Physics, Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russia
pavel-skripov@bk.ru

Nanofluids are considered for the use as high-performance coolants in a variety of practical applications. However, most of experimental studies characterizing their performance were carried out in the vicinity of room temperature, while in practical applications, the temperatures and the corresponding heat loads are expected to be much higher. Consequently, there is a need for experimental methods that would be able to compare thermophysical properties of nanofluids at wider ranges of conditions close to those found in practical systems. The objective of our study is to quantify the influence of nanoparticles on the heat conductivity of the base fluid over wide ranges of temperatures and heating power. For this purpose, we are developing an experimental methodology involving the method of controlled pulse heating of a wire probe and, also, the extensions of this approach to accommodate specific experimental challenges associated with nanofluids. This methodology enables us to characterize the effective thermophysical properties of nanofluids over wide ranges of variables appropriate for practical devices; the results for different samples can be obtained with identical heating conditions and compared directly. The methodology is demonstrated on dispersions of oxide nanoparticles in 2-propanol. Particle loadings used in experiments did not exceed 50 g/L. The reliable, reproducible experimental data were obtained at small concentrations of nanoparticles, where, due to complex competition between the different factors contributing to the heat conductivity of nanofluids, the resulting trends are difficult to access *a priori*.

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