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THERMOPHYSICAL PROPERTIES OF THE NANOFLUIDS WHICH A NEW TYPE OF COLLOID SYSTEMS

**Valery Rudyak**

Novosibirsk State University of Architecture and Civil Engineering, Russia

Nanofluids are a new class of dispersed fluids which consists of the carrier fluid and dispersed nanoparticles. Certainly a nanofluid is special type of colloid system because the size of the dispersed particles in nanofluid is strictly defined (from 1 to 100 nm). The study of the physics and transport properties of nanofluids has started relatively recently. Firstly it has been motivated by various applications (existing and future) of nanofluids in many different fields (engine cooling, refrigeration, thermal storage, drilling, lubrications, solar water heating, in different biomedical and medical technologies, and so forth). On the other hand the study of the nanofluids is very interesting from fundamental point of view, because, for example, their thermophysical properties (viscosity, thermal conductivity, equation of state and etc.) are not described by the classical theories. The studying of the nanofluids thermophysical properties and their flows began twenty years ago and has included great number of the papers (more than 5000 in the last ten years). However the obtained results were very contradictory. The last experimental and molecular dynamics data obtained by the author and his team allowed us to remove these contradictions. These data are systematically discussed in present paper. In particular the following problems are considered. (i) the viscosity of nanofluids. (ii) the thermal conductivity of nanofluids. (iii) equation of state of nanofluids. (iv) the heat transfer of nanofluids in laminar and turbulent modes. In the last part of the paper the use of the standard similarity parameters to description of the nanofluids flow are discussed.

Biography

Valery Rudyak graduated in the Molecular Physics Department, Physical Faculty at the Novosibirsk State University, Russia. He completed his PhD dissertation in kinetic theory of gases. In 1990 he defended the Doctor Of Science in Physics and Mathematics dissertation. He is an Honoured Science Worker of Russian Federation. He is the Head of Theoretical Mechanics Department of the Novosibirsk State University of Architecture and Civil Engineering; simultaneously he is the main Research Scientist of the Siberian Federal University, Russia. His main field of expertise includes the following subjects: nonequilibrium statistical mechanics, kinetic theory, rarefied gas dynamics, physics and mechanics of transport processes, transport processes in nanofluids, flows in microchannels, multi-phases fluids, laminar-turbulent transition, CFD and molecular dynamics simulation. He is the author of 6 monographs and more than 200 papers in reputed journal.

valery.rudyak@mail.ru