Nanofluids from SibFU physicists will help Siberians to get warm

Research by scientists from the School of Engineering Physics and Radioelectronics of Siberian Federal University will help to increase the efficiency of the evaporation of liquids using nanoparticles. Physicists have studied the mechanism of evaporation of nanofluids, as well as the effect of the size of nanoparticles and the material they are made of, their volume concentration and properties of the base fluid on the velocity of evaporation.

> *"Such nanofluids can increase the efficiency of heat transfer and save energy in the systems of central heating. The obtained effect is not limited by this. Evaporation of liquids is used to create micro heat pipes, compact heat exchangers, capillary pumps, and fuel cells. Fluid evaporation is also the main fire extinguishing mechanism. Evaporation "works" during the combustion of liquid fuels, in the ventilation and air conditioning systems, in membrane technologies, as well as in the self-organization formation of fractal-like structures of nanoparticles with complete evaporation of the base fluid. At the same time, the evaporation rate is a key parameter affecting the efficiency of all these technological processes. The addition of nanoparticles to the base fluid allows it to regulate and manage the data of the process accordingly,"* — said **Alexander Lobasov**, Senior Lecturer at the Department of Thermal Physics.

It was found that nanofluid evaporates faster than the pure base fluid. And the observed effect is more intense the higher the concentration of nanoparticles in nanofluid is. The rate of evaporation of nanofluid depends also on what kind of fluid was used as the base. For example, nanoparticles based on isopropyl alcohol evaporate much faster than water-based ones.

> *"Krasnoyarsk Territory is a region with a sharply continental climate, the issues of energy efficiency and energy saving are fundamental for us. The use of nanofluids as a coolant can significantly, by tens of percent, increase the efficiency of the already existing heating equipment in the power industry, housing and utilities and industrial sectors of the region. In addition to the energy complex tasks, the project solves problems that are relevant for the electronic industry of the region. JSC NPP "Radiosvyaz" and JSC "Reshetnev Information Satellite Systems" both need innovative systems for removing heat from electronic equipment,"* — says **Alexander Lobasov**.

Physicists studied the integral and local characteristics of evaporation and heat transfer of nanofluids at different temperatures using the method of experimental thermogravimetry (a change in the mass of a sample depending on increasing or decreasing temperature is recorded). Also during the experiment, non-stationary measurements of the parameters of evaporation of nanofluids at variable and constant temperature of the medium were carried out.

In addition, a theoretical study prompted scientists to one more applicable outcome. It turned out that after complete evaporation of the nanofluid, an unusual microstructured or cellular surface consisting of nanoparticles remains. The higher the volume concentration of nanoparticles in the fluid is , the larger the cell. According to the scientists, this surface can be used as an absorbent for the development of new

medicines, filters, sewage treatment plants or systems to eliminate man-made disasters, such as oil spills.

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