

The Effect of Microquantities of Moisture on Thermal Stability of High-Molecular Hydrocarbons. Experiment on Model Liquids

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Finding a means of intensification of heat exchange, as an independent line of thermophysical investigations, is not only needed for the solution of applied problems, but is also topical in studying the peculiarities of thermal properties for fluids, in particular, for high-molecular hydrocarbons in the pulse-heating regime. It is well known that the introduction of additions of a low-molecular component into an oil benefits, under certain conditions, the intensification of heat exchange [1]. Previously, a method of controlled pulse heating of a wire probe 20 mm in diameter was used to investigate “dry” samples of energy oils and samples with microadditions of a volatile impurity, in particular, moisture. In the present work the main attention is paid to an experimental study of changes in the short-time thermal stability in experiments on model liquids: heptane and hexadecane, and also practically important liquid media: polyethylsiloxane (PES-5) and polydimethylsiloxane (PMS-200) of different degrees of water-filling. Measurements were made at atmospheric pressure in the temperature range from 100 °C to 500 °C with the pulse lengths from 5 ms to 100 ms. It has been found that additions of moisture of the order of hundredths-thousandths of a percent have an appreciable effect on thermal and heat-exchange parameters at temperature values exceeding those of the thermal decomposition onset of a substance in a quasi-static process. In the available literature there are no explanations of this phenomenon. The authors believe that microquantities of moisture contribute to the thermal decomposition of the main component.

[1] Bulanov N.V. Explosive Boiling-Up of Dispersed Liquids . Ekaterinburg: Izdatelstvo UrGUPS, 2011.-232 p.

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