HEAT CRYSTALLIZATION OF POLYMER MICRO- AND NANOCOMPOSITE MATERIALS FOR HEAT AND POWER ENGINEERING EQUIPMENT

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The directions of use of polymer micro- and nanocomposite materials in heat-and-power engineering are closely related to the thermophysical characteristics of these composites modifications. Some of them are focused on the production of various heat-transfer surfaces, others to create pipelines of power systems, chimneys, protective heat-insulating layers, etc. Thus, the choice of materials for heat-and-power equipment for various purposes is based on complete and detailed information on the thermal properties of polymer micro and nanocomposites. One of the important thermophysical characteristics of polymer composites is the heat of their crystallization.

Objective. Improving the efficiency of various units and systems of heat and power equipment based on the use of polymer micro and nanocomposite materials.

Results. Studies have revealed the dependence of crystallization heat on a number of factors, such as their cooling rate, mass fraction of the filler, type of polymer matrix. In this case, the crystallization heat was determined on the basis of the crystallization exotherms obtained in the experiment in the process of cooling the composite materials from the melt at a certain rate. In accordance with the data of the studies performed, it was established that for polymer composites the specific heat of crystallization substantially depends on the type of polymer matrix. It was revealed that specific heat of crystallization is significantly higher for composites based on polyethylene than on the basis of polycarbonate. The research results showed that the specific heat of crystallization decreases with increasing mass fraction of the filler and cooling rate. At the same time, polyethylene-based composites are more sensitive to the mass fraction of the filler compared with the use of polymer matrices of polypropylene and polycarbonate.

Conclusions. Based on the results of experimental studies of the thermophysical properties of polymer micro- and nanocomposite materials, the influence of the cooling rate and the mass fraction of the filler on the characteristics of the crystallization process has been established.