THERMOPHYSICAL PROPERTIES OF THERMAL INTERFACE NANOMATERIALS FOR THERMAL STABILIZATION OF ENERGY AND ELECTRONIC DEVICES

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In recent years, interest in the creation of new nanomaterials for the promising tasks of electronics, optoelectronics and energy has increased. The emergence of new functional materials for low-current and high-current electronics and energy are dictated by the active development of nanoelectronics and nanoenergetics. Of special interest are the thermophysical properties of the surfaces of new functional nanomaterials, since numerous applications and new trends in the development of promising technological directions depend on them. The paper presents the results of research in the field of development, creation and research of thermophysical properties of new hybrid nanocomposites based on metal monodisperse microspheres, polymers and graphene flakes. The results of the technology of creating such hybrid composites, studying the properties of wetting and spreading of droplets of various working fluids on the surfaces of hybrid composites are presented. Experimental and theoretical results on the study of heat transfer (thermal conductivity) in such hybrid nanocomposites are considered. Particular attention is paid to the results of studying thermophysics and hydrodynamics during the evaporation and boiling of droplets on superheated surfaces of hybrid graphene nanocomposites, maps of regimes, conditions for existence and suppression of the Leidenfrost effect were constructed. The variety of properties of new nanocomposites based on graphene flakes allows in the future to create functional energy materials with controlled thermophysical properties both on the surface and in the volume of the material. The work is supported by the Russian Science Foundation (Grant No. 17-19-01757).