Topics: Nanostructured surfaces

Nanostructured architectures on the heater surface at nanofluids pool boiling and its role in the intensification of heat transfer

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Commonly called "nanofluids" (NF) are the new generation of heat transfer medium, constituting the colloidal dispersion of nanoparticles (NP) in usual liquids (water, EG, oils, etc.) [1]. Due to their increased heat conductivity and abnormally high heat exchange on boiling NF are promising for cooling of different power equipment (nuclear reactors, etc). An interesting feature of NF is that NP are able to create a nanostructured layer on boiling surface while working. It has different architecture, porosity and surface roughness. It is accompanied by severe (200-300%) intensification of heat transfer [2]. It is assumed that due to different NP nature they can change the state of a heat transfer surface (wettability and roughness) in a different way. Depending on NP type the porous structure is formed in a specific ΔT-zone of boiling curve and has rather different properties of a porous layer which determinates thermal parameters characterizing the heat transfer process of NF boiling.

In order to clarify this question, we studied the process of nanostructures formation on the surface of Ni/Cr- heater at different NF boiling. We studied the morphology and topography of artificial coatings and the results are compared with the values of the basic boiling parameters: specific heat flux and heat transfer coefficient. The conclusions based on experimental results are: the maximum values of the specific heat flux (q_{sp}) and heat transfer coefficient (α) refer for NF consisting of a mixture of NP with anisometric shape. While boiling process they are able to create nanostructures with the most advanced surface roughness and porosity. Most likely, this is due to the highest density of nucleation sites and the area of heat transfer surface formed in these nanostructures.

1. *Bondarenko B.I., Moraru V.N., Sydorenko S.V., Komysh D.V., Khovavko A.I., Snigur A.V.* Some peculiarities of heat exchange at pool boiling of aluminosilicates-water based nanofluids // Proceed. of the 8th International Symposium on Heat Transfer, October 21-24, 2012, Beijing, China, ISHT8-04-05.- **P**. 86-95.
2. *Bondarenko B.I, Moraru V.N., Sydorenko S.V., Komysh D.V., Khovavko A.I.* Nanofluids for energetics: Effect of stabilization on the critical heat flux at boiling // Technical Phys Lett.- 2012.-**38**, N 9.- **P**. 853-857.