

Peculiarities of water boiling in case of local pulse heating

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Temperature values of three heat exchange modes were determined by the method of controlled pulse isothermal action using a micro-heater in experiments with water. The experiments were carried out at atmospheric pressure in the conductive heat exchange mode with a delay in the beginning of boiling by 50 K , when the conductive heat exchange mode was changed to the probabilistic boiling mode and in the steady-state boiling mode with exceeding the equilibrium boiling temperature by more than 80. In the intermediate temperature range, in addition to the implementation of the conductive heat exchange mode or the boiling of superheated water, it is possible to implement the ultra-intensive heat transfer mode. Using high-speed shooting, it was found that when boiling in the transient zone, that is, in the temperature range from 430 to 460 K , significant thermomechanical vibrations of a pulsed heated wire probe can occur. In this case, the heat flux and heat transfer coefficient are doubled relative to the case of boiling (and subsequent boiling) on a fixed probe. The data obtained are important in the development of miniature devices with pulsed (less than 1 s) and local heat dissipation (about 1 square mm) from a smooth metal wall into water. The investigation has been conducted at the expense of a grant of the Russian Science Foundation (project No. 23-69-10006), <https://rscf.ru/project/23-69-10006>