Nonlinear phenomena during vapor phase generation

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Abstract

The boiling process is accompanied by fluctuations in the liquid-vapor interface. Oscillations of the vapor bubble were recorded optically by shading the optical beam with the vapor bubble. It was found that when the vapor bubble grows on the heating surface, it experiences fluctuations in volume and shape. The oscillation model is described by a system of nonlinear differential equations, the solution of which leads to a strange attractor. Positive values of the Lyapunov coefficients were found for this system of equations, which indicates chaotic oscillations of the vapor bubble during boiling of an unheated liquid [1].
In addition to a single bubble, a flow of boiling coolant with inclusions of steam bubbles was studied. The flow characteristics were analyzed based on the modulation of the probe laser beam transmitted through the coolant. The phase portrait has the form of a periodic attractor [2-3].

Temporal, correlation, and phase portraits of the oscillations of a vapor bubble during its growth on the heating surface were obtained [4].

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