curve of the heat-transfer agent, where the pressure difference required to force the heat transfer agent into the evaporation zone is provided by a smaller temperature difference. The pressure difference required to force the heat transfer agent into the evaporation zone is provided by a smaller temperature difference.

In Fig. 4b we have plotted the surface heat flux density in the evaporation zone (at the temperatures indicated in Fig. 2b) against the difference of the evaporator wall and saturated vapor temperatures.

NOTATION

\( Q \), heat flux in pipe; \( q \), heat flux density; \( \rho \), density; \( m \), mass; \( r \), heat of vaporization; \( \phi \), angle of inclination of pipe with respect to horizontal; \( g \), acceleration of gravity; \( h \), distance between beginning of vapor channels in evaporator lining and uncompensated level of liquid in heat pipe; \( d_p \), wick pore, diameter; \( \Pi \), wick porosity; \( L_1, L_2, L_3, L_4, L_5, L_6 \), and \( L_7 \), lengths of heat pipe, evaporating chamber, heat exchanger (condenser), wick, vapor channels, injector mixing chamber, and distance between nozzle and mixing chamber, respectively; \( D_1, D_2, D_3, D_4, D_5, \) and \( D_6 \), inside diameters of evaporating chamber, evaporator reservoir, nozzle, mixing chamber, vapor channels, and circulation loop tubes, respectively; \( \delta_1 \), distance of vapor channel from evaporating chamber wall; \( \delta_2 \), distance between vapor channels; \( T_{cw} \), evaporator wall temperature; \( T_{gw} \), condenser wall temperature; \( T_{cw} \), temperature of cooling water; \( u \), circulation and evaporator feed flow ratio.

LITERATURE CITED


EXPERIMENTAL STUDY OF LOCAL HEAT EXCHANGE BETWEEN AN INCLINED PLATE AND AN IMMOBILE

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The local heat-liberation-coefficient distribution is described for the surface of a plate immersed in a dispersed layer, with the angle of incidence to the main gas flow varied over a wide range.

The recent wide use of boiling layers as heat-transfer media in the operation of immersed heat exchanges requires more detailed study of the intensity of heat liberation from bodies located in dispersed layers.

The literature has considered the questions of local heat exchange from vertical and horizontal tubes and tube clusters immersed in a layer, and from vertical and horizontal plates [1-3]. The effect of the orientation of the immersed body relative to the incident flow of draft medium has been considered in less detail [4-7]. The latter studies considered the cases of flow around a plate inclined at 45° to the vertical, with 40-50% of the cross section obstructed.

The goal of the present study is a clarification of the distribution of the heat-liberation coefficient over the surface of a small plate immersed in a dispersed layer over a wide range of attack angle in both an immobile and a boiling layer.

Statement of the Problem.

In measuring time averages of local coefficient values it is desirable to create one-dimensional propagation of thermal fluxes - along the normal to the plate surface. Moreover, for more accurate measurement of local thermal flux values \( q \), large temperature drops are required between the heater and the outer surface of the plate. These requirements were satisfied with a specially designed experimental plate. The plate was constructed of beechwood because of its quite low (0.2-0.4 W/m \( \cdot \) °C) thermal conductivity and was cut across the wood grain to utilize the anisotropy of the wood's thermal conductivity. The conductivity of beechwood along the grain is twice as high as across the grain. With this construction temperature drops from 20 to 70°C along the grain were achieved (for a plate thickness on the order of 4 mm). At the same time, thermal fluxes along the surface were approximately 80 times smaller than along the normal to the surface, which permits us to consider the heat flow as one-dimensional.

The dimensions of the plate were as follows: height, 80 mm; width, 90 mm; assembled thickness, 8.5 mm. A diagram of the construction is shown in Fig. 1.

The plate construction permitted changing its angle of inclination to the vertical from +160° to -160°.

The plate axis was attached at a distance of 120 mm from the grid; with the plate vertical the lower edge was 80 mm from the grid.

Measurements were performed in an apparatus 172 mm in diameter with a grid made of layers of felt, porolon, and a metal screen with 10-\( \mu \) cells. Covering height was 200 mm. The dispersed material used was a narrow fraction of spherical aluminosilicate catalyst \( d = 2.5-3.0 \) mm (residue between 2.5- and 3.0-mm sieves with circular orifices) with a critical liquefaction velocity of 0.85 m/sec. Air supply rate was varied from 8 \( \times \) 10\(^{-3} \) to 3 m/sec.

Thermal load was varied from 1.0 to 3.5 kW/m\(^2\) with the limitation that the external wall temperature not exceed 120°C.

In preceding studies [8, 9] local heat-liberation coefficients as functions of height of a vertically oriented plate have already been presented, and a semiempirical method was proposed for calculation of \( \alpha \)-fields of such plates.

Experimental Results

Figure 2 presents values of heat-liberation coefficients averaged over one plate surface as a function of the pseudoliquefaction number and angle of rotation.