STRUCTURE OF AN ADIABATIC TWO-PHASE TWISTED FLOW IN VARIOUS CHANNELS

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ABSTRACT: Results of visual research of regimes of an adiabatic two-phase (air-to-water) flows in various channels with a continuous twisting on length (coil tubes, tubes with the twisted tape inserts, including with the tapes having slanting ribs) are presented. Operating conditions changed in following ranges: a Reynolds number on homogeneous mixture parameters Re_m=1000-200000; a Reynolds number on velocity of liquid circulation Re_o=100-12000, pressure P=0.1-0.3 MPa.

Visualization of an adiabatic two-phase (air-to-water) flows has been spent in transparent (glass or plastic) tubes. At visual research the slug, wave, annular, disperse and cord regimes have been revealed. At small velocities the flows in the channels with twisting are similar to flows in direct tube. It is noted that regimes of a two-phase flow and their boundary line in coil tubes and in tubes with the twisted tape can have essential difference, despite similitude of channels. Dependences for calculation of boundary lines of annular and disperse flows are gained. Maps of regimes of a two-phase flow in such channels are drawn.

The main feature of structure of two-phase flow in tubes with the twisted tape insert is that the liquid phase part always moves in the form of a cord on the central part of the tape which are not an active heat transfer surface (fig.1, 2). For prevention of flow on a tape the ribs can be installed on tape surface under an angle to its axis. Results of visualization have shown that installation of ribs on a tape leads to considerable decrease in quantity of the liquid leaking directly on a tape. At boiling it should promote earlier transpiration of a liquid and decrease of the demanded length of the channel.

← flow direction

Fig. 1. The cord flow in a transparent glass tube with the twisted tape insert at big value of mass gas maintenance (the liquid is dark coloured, the one half of channel is blocked by the rubber chamber)

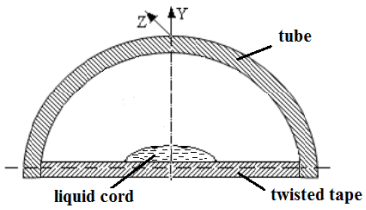

Fig. 2. Two-phase flow pattern of cord regime in cross-section of a tube with twisted tape insert