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Single- and two-phase turbulent mixing rate between adjacent subchannels in a vertical 2×3 rod array channel. (English) Zbl 1136.76626

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Summary: To complete a subchannel analysis code for prediction of thermal-hydraulic behavior of a coolant in BWR fuel rod bundle, an accurate estimation of fluid transfer between subchannels is essential. Under two-phase gas-liquid flow conditions, the fluid transfer is usually subdivided into turbulent mixing, void drift and diversion cross-flow. We focused on the turbulent mixing in this study. Until now, experimental data on two-phase turbulent mixing rate have been obtained exclusively for simpler channels with two subchannels alone, and prediction methods of the mixing rates have been proposed based on such data. In order to obtain data necessary to validate the prediction methods, we newly constructed a vertical test channel simulating a BWR fuel rod bundle, which contained six rods in a rectangular array and two kinds of six subchannels. Using this channel, flow distributions and turbulent mixing rates of both gas and liquid phases were measured for single-phase water and two-phase air-water flows under a hydrodynamic equilibrium flow condition at ambient pressure. In this paper, the experimental data on turbulent mixing rates in comparison with the data for two-subchannel system at 0.34 MPa obtained by others are presented and discussed.

MSC:

76Txx Multiphase and multicomponent flows

Keywords:

subchannel analysis; turbulent mixing rate; rod bundle; hydrodynamic equilibrium flow

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