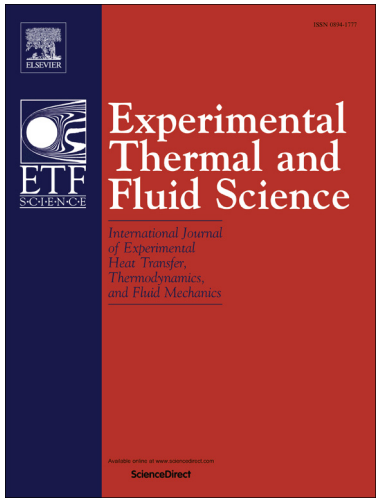

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Experimental investigation of phase split of gas-liquid two-phase flow through small holes at the pipe wall

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Abstract: An experimental and analytical study on phase split of gas-liquid two-phase flow through small holes at the main pipe wall has been performed in this paper. The inner pipe diameter of the test section is 40mm and the diameter of sampling hole is 2.5mm. Experiments were conducted in an air-water two-phase flow loop and four types of sampler with different arrangement of sampling-holes were tested. Stratified-wavy, annular and slug flows were observed. Experimental results show that phase splitting behavior is significantly influenced by the number and positions of the sampling-holes and the superficial velocities of the gas and liquid. If a swirl vane is mounted at the upstream of the four-hole sampler, an interesting phenomenon that the liquid extraction ratio maintains constant and is independent of the inlet flow patterns can be observed.

Keywords: two-phase flow; phase split; sampling hole; flow pattern

1. Introduction

Two-phase flow is very common in industries such as oil and gas production and chemical engineering. In two-phase flow system, sampling device is often used to withdraw a small portion of sample from the main stream for compositional analysis. Meanwhile, the flow rates of gas and liquid can also be measured by extracting a small fraction of representative sample from the main pipe using division and separation methods[1-3]. A reduced T-junction, which is characterized by the lateral branch is smaller than the main pipe, might be the most widely used and simplest sampling device. However, when two-phase flow passes through a dividing junction, uneven distribution of the gas and liquid phases usually takes place between the outlets [4]. This phenomenon is called as phase separation. In past several decades, a number of reports have been published on phase split of gas-liquid two-phase flow at

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