

ABSTRACT

INVESTIGATION OF THREE-DIMENSIONAL BUBBLE VELOCITIES AT CO-CURRENT AIR-WATER VERTICAL UPWARD BUBBLY FLOWS

Recently, experimental series of co-current gas-liquid upward bubbly flows in a 6 m-height and 54.8 mm i.d. vertical titanium pipe had been conducted at the TOPFLOW thermal hydraulic test facility, Helmholtz-Zentrum Dresden-Rossendorf, Germany. The experiments were initially performed to develop a high quality database of two-phase flows as well as to validate new CFD models. An ultrafast dual-layer electron beam X-ray tomography, named ROFEX, was used as measurement system with high spatial and temporal resolutions. The gathered cross sectional grey value image results from the tomography scanning were reconstructed, segmented and evaluated to acquire gas bubble parameters for instance bubble position, size and hold-up. To assign the correct paired bubbles from both measurement layers, a bubble pair algorithm was implemented on the basis of the highest probability values of bubbles in position, volume and velocity. Hereinafter, the individual characteristics of bubbles were calculated include instantaneous three-dimensional bubble velocities, Sauter mean diameters and the movement angle in polar-azimuthal directions. The instantaneous three-dimensional bubble velocities are discussed through the distribution results of the axial, horizontal, radial and azimuthal velocities in statistical parameters. The present results show satisfactory agreement with previous works.

Keywords: Bubble velocity, Bubbly flow, Gas-liquid two-phase flow.