A CFD-PBE model of an air-kerosene bubble column under high pressure

Tran Van Bay, Ngo Ich Son, 임영일†, 이동현[1],
고강석[2], 노남선[2]
한경대학교; [1]성균관대학교; [2]KIER
(limyi@hknu.ac.kr†)

A gas-liquid Eulerian computational fluid dynamics (CFD) coupled with the population balance equation (PBE) was developed in an air-kerosene bubble column under high pressures up to 35 bar. The mixture shear stress transport k-ω turbulent model with modification of turbulent liquid viscosity was used. The drag coefficient, breakup and coalescence model were proposed to account for the pressure effect on the gas holdup and the fraction of micro-bubbles. The bubble column had 0.1 m in diameter and 1.8 m in height. The kerosene was filled initially at a height of 1 m. The air was injected with a superficial velocity of 12.3 mm/s through a gas distributor located at the bottom of column. The calculated specific pressure drop, total gas holdup and micro-bubble fraction were validated with experimental data. The specific surface area was 196.5, 296.6, 328.4 and 348.7 m2/m3 at 1, 15, 25 and 35 bar, respectively. The CFD-PBE model can be used to predict the hydrodynamics of a gas-organic liquid bubble column at high pressure.