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CFD-PBM simulation of bubble columns based on fixed pivot method: Influence of the moment closure[1] XIAOPENG SHANG, BING FENG NG, MAN PUN WAN, SHIRUN DING, Nanyang Technological University — The fixed pivot method can conserve two moments while other moments suffer from inherent errors caused by internal inconsistency. The influence of moment closure in the CFD-PBM simulation is studied on population balance and hydrodynamics of bubble columns. The CFD-PBM model, which conserves the surface area and volume (second and third moment, i.e. CFD-PBM-SV model), and the number and volume (zeroth and third moment, i.e. CFD-PBM-NV model), is developed based on a two-fluid model. A rectangular bubble column is simulated by the CFD-PBM-SV and CFD-PBM-NV model, respectively. It is found that both models can capture the oscillating plume of the gas-liquid flow inside the reactor. The flow features predicted by the CFD-PBM-SV model show better agreement with experimental data, in terms of the time-averaged vertical liquid velocity, gas hold-up and plume oscillation period, than the CFD-PBM-NV model. It is speculated that the better performance of the CFD-PBM-SV model is ascribed to more accurate predictions of interfacial forces and momentum transfer between two phases due to internal consistency of the local Sauter Mean Diameter compared to the CFD-PBM-NV model.

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