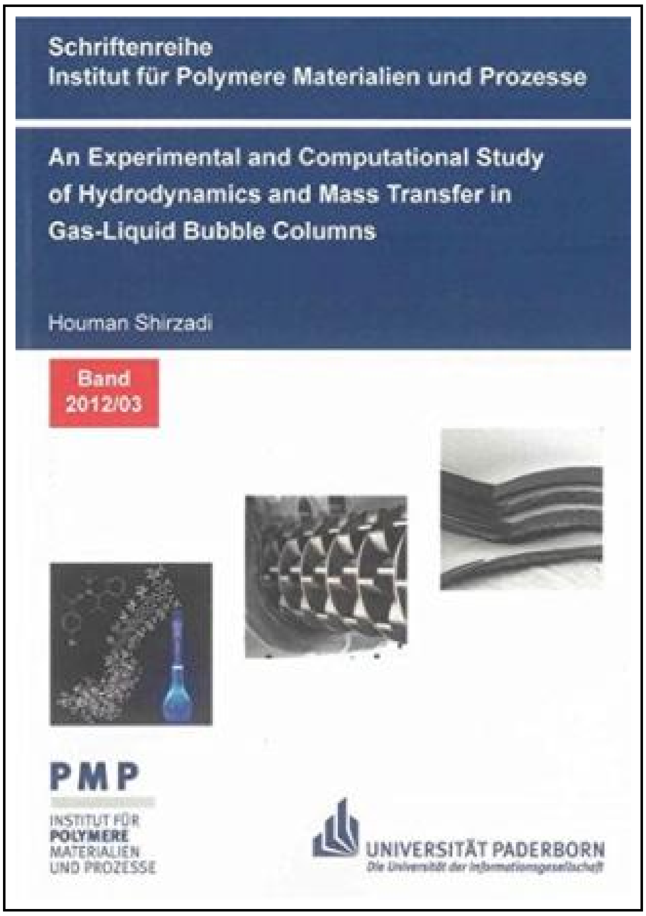
An Experimental and Computational Study of Hydrodynamics and Mass Transfer in Gas-Liquid Bubble Columns



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Shaker Verlag Apr 2012, 2012. Buch. Book Condition: Neu. 208x152x10 mm. Neuware - In this thesis with the aid of experimental measurements and CFD modelling validations, the hydrodynamics and mass transfer in the gas-liquid bubble columns have been simulated. For this purpose, the commercial CFD-software ANSYS CFX has been applied. The experiments have been carried out with a laboratory scale bubble column and could be divided into two distinct parts; first part, studying the hydrodynamics i.e. the axial dispersion coefficient and the gas hold-up inside the bubble column with respect to the different flow rates of gas and liquid phase and the second part, studying the mass transfer i.e. the volumetric mass transfer coefficient, again with respect to the different flow rates. Following the experimental studies, the respective CFD model with the Eulerian- Eulerian approach and a single sized bubble as the disperse phase was set to simulate the flow field. For this purpose different closure models such as turbulence and drag models have been examined and these results were compared with the experimental data. Furthermore, a mass transfer model has been developed in order to account for the mass transfer between the phases. For this part of the simulations, the volumetric mass transfer coefficients obtained from the experiments, were set into the CFD model for the numerical calculations. Therefore, the respective experimental flow conditions were applied in the simulations to validate the CFD model. It was observed that the hydrostatic pressure inside the bubble column plays an important role in the mass transfer between the two phases. Finally, the simulation results show that the Euler model with all its simplifications is still an appropriate and cost effective approach for the numerical simulation of the two phase flow in the bubble column reactors. 118 pp. Englisch.

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