

WORKGROUP FOR MULTIPHASE FLOWS

Turbulence in bubble flows

Grant number

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Project title

Investigation and modelling of turbulence in bubble columns

Project leader

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Keywords

turbulence, bubble columns, modelling of source terms, experiments

Short description of the project

The analysis and modelling of turbulence in bubbly flows using the bubble column as an example is subject of this research project. The fluid flow and the turbulence in this widespread apparatus is induced only by the bubble rising. That's why it is necessary for the planned development of a numerical calculation approach basing on the time averaged Navier-Stokes equation in connection with the k-epsilon turbulence model to introduce appropriate source terms into the conservation equations of the fluid phase to comprehend the influence of the bubbles on the fluid phase. Especially the turbulence induced by the bubble rising is not well understood up to now and that's the reason why only little knowledge about the modelling of this effect in the conservation equations for the turbulent kinetic energy k and its dissipation ϵ is available. This is the emphasis of the research project as it is planned to develop suitable source terms for the modelling of bubble induced turbulence. Making this possible direct numerical simulations of the motion of bubble swarms basing on the time dependent solution of the three dimensional Navier-Stokes equations and a tracking algorithm should be used for the calculation of the motion of bubble contours. Besides, experimental investigations of a bubble column by means of Particle-Image Velocimetry (PIV) and phase-Doppler anemometry should be carried out to check the direct numerical simulations and to validate the modelling of the source terms of the equations for the turbulent kinetic energy and its dissipation. First of all, the investigations should be focussed on the aeration with fine bubbles at low gas contents.

Turbulence in bubble columns final



report

