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XFLOW

Project title: **Ultrafast X-Ray Tomography of Turbulent Bubble Flows**

Principal Investigator: **Dr. Markus Schubert**

Hosting Institution: **Helmholtz-Zentrum Dresden-Rossendorf e.V. Germany**

Starting date: **01.01.2013**
Duration (months): **48**

Summary

Multiphase reactors are omnipresent in chemical engineering and dominate today's manu-facturing of chemical products such that they are present in most of our daily products. That implies a huge economic and ecologic impact of the reactor performance. The basic idea of a multiphase reactor is to contact chemical precursors and catalysts in a sufficient time for the reaction to proceed, but reactor performance is crucially affected by the complex reactor hydrodynamics. A proper optimization would imply that multiphase flows are adequately understood.

Gas bubbled into a pool of liquid is the simplest example of a multiphase reactor. Bubble columns or distillation columns, however, house millions of bubbles emerging in swarms with interactions such as coalescence and breakage events that determine the whole process behaviour. The understanding of such disperse gas-liquid flows is still fragmentary and requires a ground-breaking update.

The aim of the project is to apply the worldwide fastest tomographic imaging method to study such turbulent gas-liquid dispersed flows in column reactors such as bubble columns and tray columns. The project intends to provide unique insights into the bubble swarm behaviour at operating conditions that have been hidden so far from the engineer's eyes.

The project is foreseen to enhance the fundamental understanding of hydrodynamic parameters, evolving flow patterns and coherent structures as well as coalescence and breakage mechanisms, regardless of if the systems are pressurized, filled with particle packings, operated with organic liquid, slurries or with internals.

The interdisciplinary team shall re-establish the process intensification route for multiphase reactors by a new understanding of small-scale phenomena, their mathematical description and extrapolation towards the reactor scale and therewith providing a tool for reactor optimization.