

Particle Tracing Based Validation for CFD Models of Stirred Reactors

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Modeling the flow field in a stirred tank is always a challenging task because multiple processes (e.g. heat and component transport processes, reaction) must be considered to build an adequate model. Nowadays Computational Fluid Dynamics (CFD) models can be used to model the different physical phenomena in a stirred tank. However the validation of these models is not an easy task. In this work particle tracing methods were used to analyze the flow patterns in a laboratory glass reactor. The particle movements were recorded from two different angles to follow the trajectories of the particles in three dimensions. Beside the physical experiments, the geometry and the momentum balance model were implemented in CFD software. Based on the experimental results the CFD models were validated. A statistical analysis was applied in the model validation. MATLAB/Simulink was applied for video processing and COMSOL Multiphysics for CFD model implementation and simulation studies. Based on our experience the proposed method can significantly simplify the validation of CFD models.