Hessisches Kompetenzzentrum
für Hochleistungsrechnen

FABIENE - Flexible Bereitstellung von Strom und Kraftstoffen aus Braunkohle basierend auf der Wirbelschichtvergasung

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Clusters
Lichtenberg Cluster Darmstadt

Software
ANSYS

Institute
Institut Energiesysteme und Energietechnik

University
Technische Universität Darmstadt

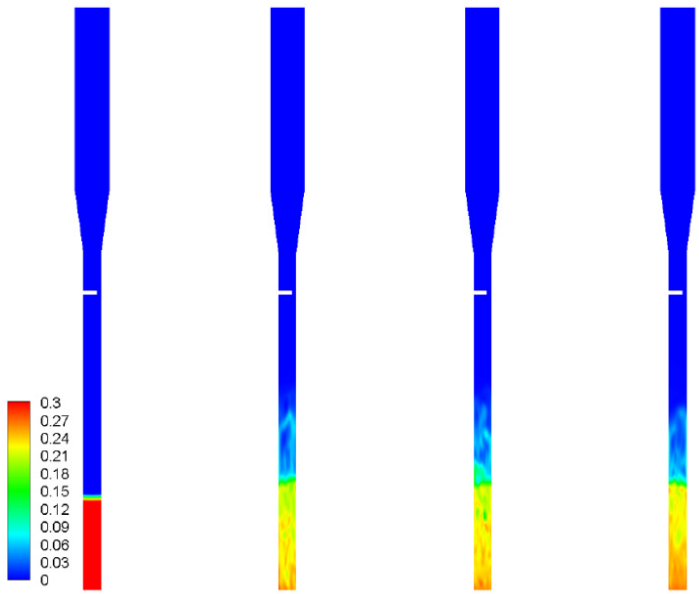

Figure 1: Volume fraction of solids at 0s, 50s, 100s and 150s.

Introduction

The aim of this work is the development and validation of a numerical model of the coal gasification in a fluidized bed. This includes the modelling of the multiphase flow and the development of a chemical reaction model for the description of the gasification kinetics. In a first step, data from a 2 kWth laboratory fluidized bed is used to validate the model before it is used for the simulation of the 500 kWth pilot plant.

Methods

The laboratory fluidized bed were simulated using experimental data for validation. Kinetic models were chosen and added to ANSYS Fluent using UDFs. The kinetic parameters were determined by experiments or taken from literature. For the description of the multiphase flow the two-fluid model was used.

Results

To reduce the calculation time, the calculation domain was shortened compared to previous simulations. This led to reversed flows at the outlet of the domain. Furthermore the gasification reaction rates are somewhat overestimated in the

simulation. Nevertheless a comparison with the experimental results showed a good agreement.

Discussion

The main reason for the deviations between the numerical and experimental results seems to be the overestimation of the gasification reaction rates. A reason could be that the kinetics were derived under laboratory conditions (TGA). For further investigations this influence should be investigated.

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