Modeling pressurized entrained flow gasification of solid fuels plays an important role in the development of Integrated Gasification Combined Cycle (IGCC) power plants and other gasification applications. A better understanding of the underlying reaction kinetics is essential for the design and optimization of entrained flow gasifiers – in particular at operating conditions relevant to large-scale industrial gasifiers, i.e. at high temperatures and high pressures. CFD simulations aim to predict conversion rates as well as product gas compositions in entrained flow gasifiers. A mechanistic and consistent modeling approach is necessary in order to develop a predictive model. The presented modeling approach is based on the software Ansys Fluent 15.0 and includes several detailed submodels in a User Defined Function (UDF), in particular relating to reaction kinetics at high temperatures. The developed CFD model is validated against experimental data, obtained from a pilot-scale entrained flow gasifier operated at the Institute for Energy Systems (Technische Universität München). The comparison of the model with these experiments shows a good correlation for the investigated lignite. Therefore, the modeling approach is suitable for describing the relevant kinetic processes in entrained flow gasifiers. The validated CFD model is then applied to a Siemens test gasifier geometry. Simulation results and
characteristic parameters are analyzed in detail and provide new insights into the gasification process.

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