Spatially Resolved Simulations of Heterogeneous Dry Reforming of Methane in Fixed-Bed Reactors

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In this work, we investigated the specially resolved heterogeneous catalysis of the Dry Reforming of Methane (DRM) in terms of CFD simulations.

A catalytic, spherical fixed-bed reactor is simulated with a small tube-to-particle-diameter. The randomly packed bed (D = 16.2 mm, dP = 4 mm, H = 40 mm) was generated using the Discrete Element Method (DEM), which consists of 113 mono-disperse spheres. A detailed reaction mechanism is implemented involving 42 irreversible reactions with 12 surface-adsorbed species and 6 gas phase species. The chemical composition equations are calculated by DARS-CFD. In addition, the operator splitting method is applied. Moreover, conduction through the spheres was considered. We combined several process parameters, i.e. temperature, inlet velocity and feed composition, to achieve a better understanding of the characteristics of DRM in fixed-bed reactors.

The applied investigation of spatially resolved simulations of fixed-beds allows a deeper understanding of this highly transient and multi-dimensional process.

Author Company:
Technische Universität Berlin
Author Name:
Thomas Eppinger (CD-adapco) Matthias Kraume (Technische Universität Berlin)
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