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A Comparison of the Shrinking Core Model and the Grain Model for the Iron Ore Pellet Indurator Simulation

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Highlights

- The shrinking core model has inherent limitations to the reaction on a porous pellet.
- The shrinking core model is compared with the grain model for indurator simulations.
- Similar bed temperature results can be obtained for the normal induration condition.
- Discussion of the applicability needs the conversion profiles and reaction regimes.
- The grain model is advisable to enhance the validity of the indurator simulation.

Abstract

The current study revisits the particle combustion modeling in the simulation of iron ore pellet indurator, which is the process to dry and fire the pellets as a pretreatment for blast furnace. Although the shrinking core model has been frequently used in the previous studies due to its simplicity, its limitation for the porous pellet should have been evaluated. Instead, the grain model could have been used as it conceptually gives the better description. In that context, the shrinking core model is compared against the grain model in the simplified isothermal condition and the complete indurator simulation to demonstrate the applicability. Despite the possible differences in the conversion profiles along the reaction regimes, the models provide apparently reasonable bed temperature results for the normal indurating conditions. However, the shrinking core model needs to be applied with caution and its validity should be questioned when the operating conditions change.

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