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Recovery of iron from a high-sulfur and low-grade iron ore

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Highlights

- A method is proposed for recovery of iron from its sulfide.
- Thermodynamic calculations showed the possibility of the reduction reaction without SO₂ emission.
- Sulfur can be captured by using CaO.
- Reduction reaction is controlled by diffusion.

Abstract

The present study was carried out to recover iron from a low cost, low-grade and high-sulfur iron ore without sulfurous gas emission. This method is based on coal-based direct reduction followed by magnetic separation method. Thermodynamic of reaction was evaluated by FactSage at a constant pressure of 1 atmosphere. Furthermore, effects of temperature, residence time, coal/ore and lime/ore ratios on the reduction degree of the ore were also studied. The reduced ore was investigated by X-ray diffraction analysis and scanning electron microscopy. Analysis of the experimental data showed that a well-known three-dimensional diffusion model describes predominant mechanism of the reaction with activation energy of 159 kJ/mol. Finally, quantitative chemical analysis revealed that total iron content and metallization degree

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