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Development of low carbon sinter technology using low melting point additives

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In the ironmaking process, more than 80% of the steel industry's CO2 emissions are produces, and low-carbon blast furnace (BF) operations are needed to achieve carbon neutrality.
Sinter is a major raw material for the BF, and CO2 generation is inevitable because carbon materials (CM), such as coke and anthracite, are used during sintering process. It is necessary to reduce the use of CM to lower CO2 emissions during sintering process. A decrease in CM usage also implies low temperature sintering.
The maximum sintering temperature exceeds 1350℃, and if sintering can be achieved at a lower temperature, CO2 emissions can be reduced by decreasing the amount of CM used. Using an additive with a low-melting point (low-MP) is a key factor for achieving low temperature sintering.
In this study, three types of iron ore and limestone were used to produce low-MP additives. Experiments were conducted by varying the mixing ratio of iron ore and limestone, the sintering temperature, and the sintering time. The conditions for manufacturing additives with a MP of approximately 1213℃ were derived by optimizing the mixing ratio and firing temperature of iron ore and limestone.
In addition, an experiment was conducted using by-products generated in the steel mill. Firstly, recyclable by-products were selected, and the conditions for producing a low-MP additive with a melting point of approximately 1224℃ were derived by optimizing the sintering temperature and the mixing ratio of the by-products.
When a low-MP additive is used, the CM cost can be reduced by more than 5% compared to standard case while maintaining equal or higher sinter quality. Through this improvement, it is possible to realize a low carbon sintering process.

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