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Fundamental Studies on the Powder Metallurgical Decarburization of High-Carbon Ferrochrome

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Efficient production of low-carbon ferrochrome is very important for industry, because it plays an important role as an alloying material. Low-carbon ferrochrome is generally produced by the oxidation of smelting high-carbon ferrochrome melt in electric furnace. On account of expensiveness of this process, another method based on the solid-state reaction was developed and used commercially at present. But the mechanism of this process has not still been sufficiently made clear.

The purpose of this study is to know the change of state in the reaction between high-carbon ferrochrome powder and oxygen at high temperature. Analysis of weight change during reaction and microscopic structure of the products were used as means of observations.

When oxygen is used as oxidizing agent, high-carbon ferrochrome was proved to be oxidized directly to the oxide so far as the partial pressure was not small, and also its oxidation rate of high-carbon ferrochrome was seemed to be mainly controlled by the material transfer in the oxide layer. Moreover, it was found that the oxidation rate was highly accelerated by the addition of small quantity of catalytic substances such as alkaline chlorides. The oxidation product was nearly the same as chromium oxide, as far as the oxidation did not proceed to considerable extent. But the property of the oxide was influenced by the oxidation temperature and oxidation degree.

When partially oxidized ferrochrome is heated at higher temperature in reduced pressure, decarburization takes place by the interaction of oxide and carbide. In this decarburization, properties of the coated oxide—mainly its porosity, was found to have much influence on the decarburization.

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