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## Production conditions of porous iron whisker for the gas reforming in CRIP-D ironmaking process

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Currently, the CO2 emission in ironmaking industry is one of the biggest environmental issues. To solve this issue, some alternative carbon recycling ironmaking processes such as carbon recycling BF are under development. However, those cannot achieve true carbon neutrality. Our group has suggested a new carbon recycling iron making process, CRIP-D, using carbon-iron ore composite. In this process, porous iron whisker produced from the biomass char-iron ore composite will be used for the catalyst of reforming the emitted gas from various ironmaking processes such as BF and BOF. In the gas reforming step, reverse water gas shift reaction, RWGS is used. It is known that iron has a potential as a RWGS catalyst in terms of its high selectivity and economic efficiency. However, the most effective characteristics of porous iron as a catalyst in CRIP-D is not determined. In this study, the production conditions of porous iron to draw the most effective characteristics as a catalyst in CRIP-D are investigated.

A composite sample using hematite reagent and several woody charcoals was prepared in a tablet or powder form. The molar ratio of carbon in char to oxygen in hematite was set as 0.75 and 0.8. Composite sample was heated up to the target temperature from 900 to 1100°C for 40, 90 and 120 min. The concentration of the exhaust gas from the sample during the reduction was measured by gas chromatography. In addition, microstructure of the sample was evaluated by SEM. The characteristics of woody charcoal are evaluated by TG-DTA.

The formation of porous iron whisker depended on the gasification property of charcoal such as peak temperature and hold temperature. Some sample can be seen both whisker and porous structure. It will be discussed from the perspective of gas analysis and reaction equilibrium.

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