Laboratory scale sintering

CSIRO has developed a laboratory scale sintering method that simulates plant scale sinter in a controlled environment to help understand the fundamental sintering behaviour of hematite/magnetite ores

Optimising sintering performance

The laboratory scale sinter test methods developed by CSIRO allow rapid determination of the relative sintering performance of numerous ore blends faster and at much lower cost than at plant or pilot scale.

This approach enables:

- isolation of individual ore behaviour within a sinter blend
- determination of matrix strength
- characterisation of nucleus stability
- determination of fundamental behaviour of ore types, linked with CSIRO's ore characterisation scheme, and
- direct correlation with pot-grate sintering.

The process

Small samples of fluxed ore are fired in a laboratory tube furnace. The temperature is externally regulated and a low oxygen potential atmosphere is used. The blend ratios and chemistry can be adjusted, and fluxed to industry standard basicity and SiO_2 levels.

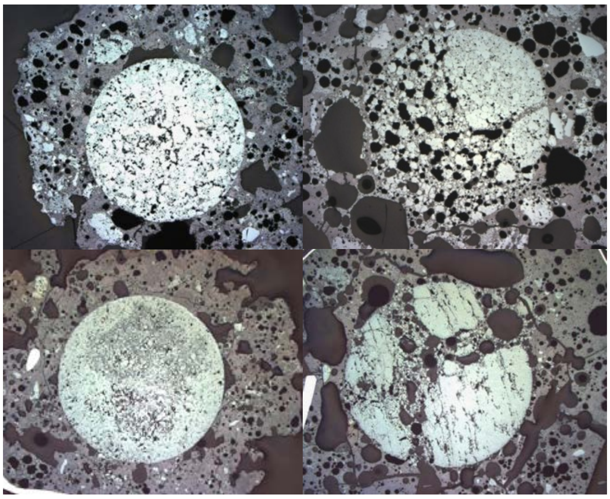
Matrix reactivity testing

Four grams of -1 mm sample material is compressed into a compact. The compacts are fired in pairs and undergo a mechanical strength (TI) test and temperature versus TI melting curves are produced.

A matrix TI of 80 % +2 mm is equivalent to a 65% pot-grate TI value. An additional compact is sectioned and imaged to provide a qualitative analysis of the pore structure.

Nucleus assimilation test

Nucleus assimilation behaviour is determined by embedding measured cores in a -1 mm blend matrix of known composition. Samples are fired at 1330°C and 1290°C. The fired compacts are sectioned, imaged and the area of remnant core is measured. The percentage assimilation with the matrix is calculated and cores are characterised qualitatively as having low, medium or high reactivity.



Photomicrographs of 3 mm (top) and 6 mm (bottom) polished cross-sections from fired hematite-dominated cores embedded in a -1 mm Japanese Steel Mill (JSM) matrix at 1290°C (left) and 1330°C (righ).

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