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Research interests:

Desulphurisation in iron- and steelmaking

Converter steelmaking

Hlsarna ironmaking

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Sulphur removal in iron- and steelmaking

RECENT RESEARCH ACTIVITIES:

Desulphurisation of Hlsarna hot metal

Hlsarna is a new ironmaking process that is being developed at Tata Steel IJmuiden that reduces CO₂ emissions. Hlsarna hot metal (HsHM) has a different composition compared to normal hot metal (HM) from a blast furnace (BF); notably much higher sulphur [1,2].

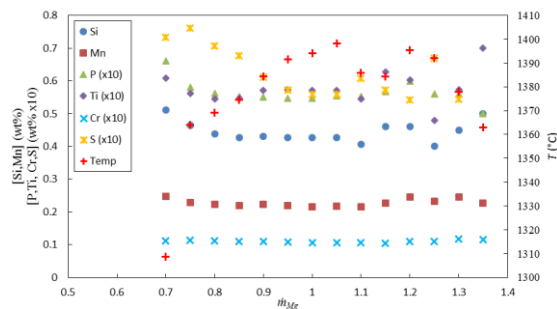


Fig 1. HM composition and temperature vs Mg consumption.

Nearly 10 000 (BF) heats of Tata Steel IJmuiden were analysed, to see the effect of HM composition and temperature on the desulphurisation efficiency (Fig. 1). The lower temperature, lower silicon and higher sulphur have a positive effect on the desulphurisation efficiency, which indicates HsHM can be desulphurised more efficiently [2].

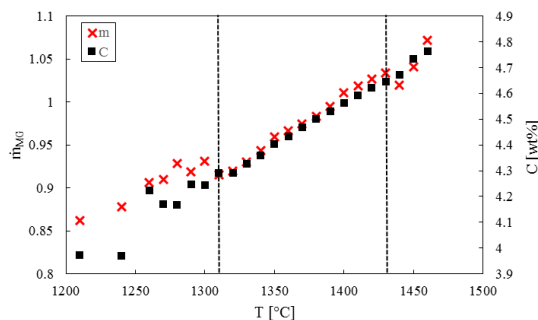


Fig. 2: Mg consumption and carbon vs HM temperature.

The effect of carbon on the HM desulphurisation efficiency is still being investigated. In the data set carbon was calculated based on temperature, sulphur and silicon. Fig. 2 shows that it is hard to determine the effect of carbon without temperature on Mg consumption. Statistical analysis and carbon measurements are planned [2].

Optimal HM desulphurisation slag

In HM desulphurisation the slag should have a high sulphide capacity to remove the sulphur from the HM. The slag's physical conditions should be such that the iron losses during skimming are minimised (iron losses are one of the major costs in HM desulphurisation).

Slag viscosity has a major impact on the iron losses. Too high viscosity leads to iron being entrapped in the slag in emulsion ("emulsion loss"). Too low viscosity means it is difficult to remove the slag, which leads to iron being removed as well ("entrainment loss").

In this research experiments to determine sulphide capacity and viscosity of the slag will be combined with Factsage calculations and plant experience to determine the optimal slag composition.

(Presentation planned at ICS 2018)

KEY PUBLICATIONS:

1. FNH Schrama, EM Beunder, B van den Berg, Y Yang, R Boom; **Sulphur removal in ironmaking and oxygen steelmaking**, Ironmaking and Steelmaking, 2017, **44** (5), 333-343.
2. FNH Schrama, EM Beunder, JWK van Boggelen, R boom, Y Yang; **Desulphurisation of Hlsarna hot metal – a comparison study based on plant data**, STIS 2017 in Kanpur, 419-422