

Thermodynamic and Kinetics on Slag-Steel-Inclusion Interactions

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ABSTRACT

Steel cleanliness in terms of non-metallic inclusions has considerable influence on steel properties. During the metallurgical process, slag services important functions on steel cleanliness control, e.g. physically it prevents the steel re-oxidation (limiting the air infiltration) and absorbs/dissolves the inclusions at steel/slag interface; chemically it removes the impurity elements (S and P) from the steel melts.

In this presentation, the desulphurisation effect of CaO-Al₂O₃ based slag and the slag-steel-inclusions interaction with respect to de-oxidation reaction were investigated based on the thermodynamic and kinetics considerations.

The sulphide capacity of the slag and sulphur distribution between steel and slag was calculated with the aid of FactSage software; the S evolution in steel phase and the formation of sulphide inclusions were then predicted. The de-oxidation equilibrium between slag/steel and steel/inclusions was compared.

The influence of slag on steel composition through the de-oxidation reaction was discussed with a kinetic model, and consequently the influence of the slag composition on the formation of oxide inclusions was discussed.

Through the comparison of experimental data with calculation results, it can be concluded that the steel and inclusions chemistry can be precisely predicted with thermodynamic and kinetic modelling.