

# steel research

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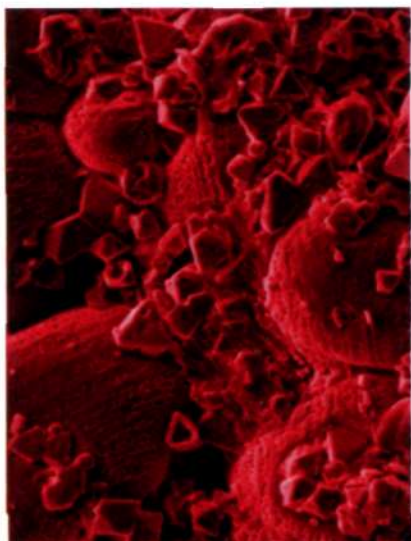
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Kuo-Chih Chou, Jiayun Zhang

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## Cover Photo:

The cover shows a SEM image of CaO-MgO-SiO<sub>2</sub>-Cr<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub> slag followed annealing at low oxygen partial pressure by Albertsson et al.

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Germany

## Contents

### Review

R. Boom\*, S. Riaz, Y. Xiao and  
K. C. Mills

Evolution of Published Research  
on Molten Slags and Fluxes in the  
Second Millennium

623



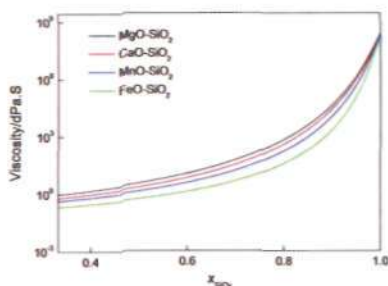
A survey on research on slags has been carried out published from 2000 to 2010. The centre of gravity of the metals industry has shifted eastwards towards China, and slags and fluxes literature follows this shift. Increased attention on sustainable metals production is reflected in the type of research on slags. An in-depth analysis is given of papers published in 2010 in selected journals from China, Europe and USA.

### Full Paper

G.-H. Zhang\* and K.-C. Chou

Modeling the Viscosity of Aluminosilicate Melt

631



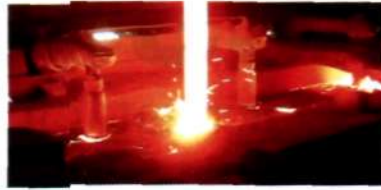
A structurally based model is developed to calculate the viscosity of aluminosilicate melts by composition and temperature. According to the comparisons with other viscosity models, better estimation results can be obtained by the present model for both quinary, quaternary, ternary, binary, and unary systems involving MgO, CaO, FeO, MnO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> components.

# Contents

L. Holappa\*, M. Kekkonen, S. Louhenkilpi, R. Hagemann, C. Schröder and P. Scheller

## Active Tundish Slag

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The concept of “active tundish slag” aims definitely at improving of steel cleanliness by tailoring a proper tundish slag. In this project computation of phase diagrams and eventual reactions between steel and slag in the tundish are applied. Interfacial phenomena controlling inclusion removal and dissolution into tundish slag are experimentally studied. The results are finally discussed and concluded.

B. Glaser, L. Ma and D. Sichen\*

## Determination of Experimental Conditions for Applying Hot Wire Method to Thermal Conductivity of Slag

649

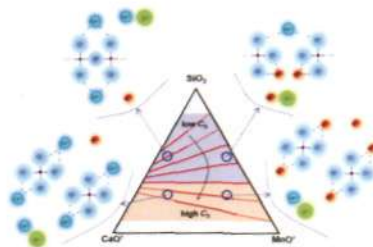


To apply the hot wire method for slags at steelmaking temperatures, a numerical model is developed, cold model experiments are conducted, and test measurements using a high temperature experimental setup are carried out. To minimize natural convection and obtain reliable measurements, the crucible diameter, the hotwire diameter, the applied current, the position of the wire in the crucible, and the cooling on the upper surface of the crucible are studied. Investigations into the choice of sheathing material of the circuit exposed to the slag are also made.

J. H. Park

## Competitive Dissolution Mechanism of Sulfur in Ca–Mn–Silicate Melts: Structural View

664



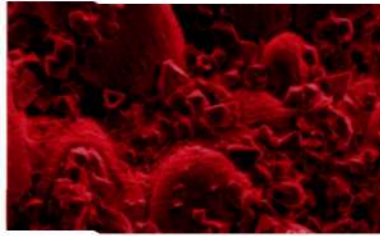
The sulphide capacities of the CaO–SiO<sub>2</sub>–MnO(–Al<sub>2</sub>O<sub>3</sub>–MgO) slags are measured at 1873 K using a gas–slag equilibration method. The effects of MnO and the MnO↔CaO substitution on the sulphide capacity of molten slag are also investigated based on the structural view of silicate melts. The dissolution mechanism of sulphur in Ca–Mn–silicate melts can be explained by the “Competitive dissolution mechanism.”

# Contents

G. Albertsson\*, L. Teng, B. Björkman,  
S. Seetharaman, and F. Engström

Effect of Low Oxygen Partial Pressure  
on the Chromium Partition in CaO–  
MgO–SiO<sub>2</sub>–Cr<sub>2</sub>O<sub>3</sub>–Al<sub>2</sub>O<sub>3</sub> Synthetic Slag  
at Elevated Temperatures

670

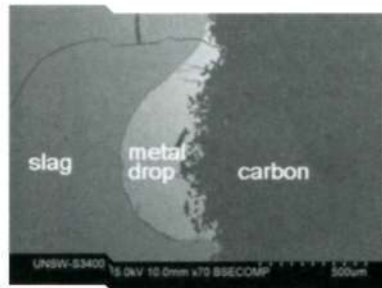


Leaching of chromium from the slag deposits is a major environmental problem that needs serious attention. Chromium in slag if not stabilized in spinel phase, could oxidize to Cr<sup>6+</sup>, and leach out by rain water. In the current work, the effect of alumina addition on chromium partition in slags been studied under the conditions close to the industrial. The results presented can reveal how to optimize spinel phase precipitation.

O. Ostrovski\* and D. Swinbourne

Slags in Production of Manganese  
Alloys

680

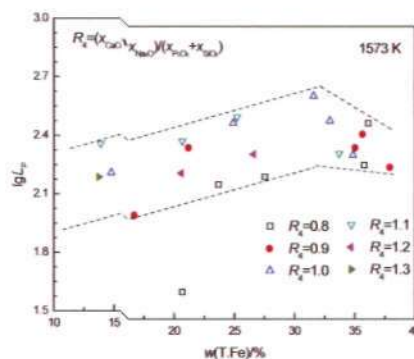


The paper analyses the equilibrium partitioning of manganese and silicon between slag and alloy during the production of high carbon ferromanganese (HC FeMn) and silicomanganese (SiMn) in comparison with industrial and experimental data. In production of HC FeMn, manganese slag–metal partitioning is far from equilibrium; in the production of SiMn, manganese, and silicon partitioning between the metal and slag is close to equilibrium at 1600°C.

G. Li\*, C. Zhu, Y. Li, X. Huang and  
M. Chen

The Effect of Na<sub>2</sub>O and K<sub>2</sub>O on the  
Partition Ratio of Phosphorus be-  
tween CaO–SiO<sub>2</sub>–Fe<sub>1</sub>O–P<sub>2</sub>O<sub>5</sub> Slag and  
Carbon-Saturated Iron

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The partition ratios of phosphorus between CaO–SiO<sub>2</sub>–Fe<sub>1</sub>O–P<sub>2</sub>O<sub>5</sub> slag with Na<sub>2</sub>O or K<sub>2</sub>O addition and solid pure iron are measured at different temperatures to learn about those between the same slag and carbon-saturated iron. The experimental results shows that both Na<sub>2</sub>O and K<sub>2</sub>O addition can improve the dephosphorization ability of the experimental slag and they have similar dephosphorization ability under the same experimental conditions.