 Thermodynamics of Calcium Ferrite Slags at 1200 and 1300°C

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The Behaviour of Lead in Silica-Saturated, Copper Smelting Systems
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The equilibrium distribution coefficients of lead between the
matte, slag and metallic phases in the silica-saturated, copper
smelting system were determined. These experiments were carried
out by simultaneously equilibrating the various phases in silica
crucibles at 1300°C. The conditions investigated in this study
ranged from iron and copper alloy saturation at low oxygen poten-
tials to a sulfur dioxide partial pressure of 0.1 atm and up to a
matte grade of 75 wt. % Cu. The lead was found primarily in matte
except in the presence of the copper alloy phase. The accumulation
of lead in the copper alloy phase was pronounced, particularly at
low oxygen potentials. Under conventional smelting conditions, the
lead content in slag increased with increasing matte grade. The
behaviour of lead was explained by proposing metallic and sulfidic
species in matte and oxidic and sulfidic dissolution in slag. In
this manner, the activity coefficients of the various species were
calculated in their respective phases.

Thermodynamics of Calcium Ferrite Slags at 1200 and 1300°C
Yoichi TAKEDA, Shigetsu NAKAZAWA and Akira YAZAWA

Oxygen isobars and liquidus isotherms of the system CaO-FeO-Fe₂O₃
at 1200 and 1300°C were determined by quenching samples equilibrated
with CO₂-CO mixtures. The iron liquidus and the melt coexisting
with two solids were carefully examined in terms of their composi-
tion as well as the equilibrium oxygen partial pressures, po₂. At
1200°C, po₂ was 10⁻⁷.⁷⁰ atm when the slag coexisted with magnetite
and dicalcium ferrite. At 1300°C, the melt region extends to the
CaO-Fe₂O₃ join, where po₂ was 10⁻⁰.₆₆ atm (air) or higher. Within
the range of po₂ from one order above that at iron saturation to
10⁻⁴ atm, the slag composition, po₂, and the temperature T are re-
lated by the equation: \( \log(\text{Fe}^{+++}/\text{Fe}^{++}) \approx 0.170 \log po₂ + 0.018(\text{wt} \% \text{CaO}) + 5500/T - 2.52 \). Activities of CaO(s), FeO(1), and Fe₃O₄(s) in
the slag were calculated from the po₂ data by combining the avail-
able thermal data and/or by Gibbs-Duhem equation.