

## **INTER-DIFFUSION IN MOLTEN SLAGS**

J.E. Kelly, S. Sun, S. Jahanshahi and R.F. Johnston

Transition metals such as iron enhance the rate of inter-diffusion by orders of magnitude due to their multi-valency. This work has examines inter-diffusion as a function of temperature (1400-1600 C) and iron oxide content (~10-60 wt % Fe<sub>2</sub>O<sub>3</sub>) in an iron oxide-lime-silica slag under two regimes. The first imposes an anion gradient on the slag to drive diffusion, while the second method imposes an anion and cation gradient to drive diffusion. Results indicate that: (1) inter-diffusion coefficient is approximately a linear function of iron oxide content, from 10 to 60 wt % Fe<sub>2</sub>O<sub>3</sub>, ranging from approximately 1 to 10 x 10<sup>-4</sup> cm<sup>2</sup>/s over the range of conditions studied, (2) apparent activation energy for diffusion decreases as wt % Fe<sub>2</sub>O<sub>3</sub> increases, at 20 wt % Fe<sub>2</sub>O<sub>3</sub> Ea is 180 kJ/mol, whilst at 60 wt % Fe<sub>2</sub>O<sub>3</sub>, Ea is 70 kJ/mol.