ABSTRACT

KEY WORDS : Smelting reduction, Iron oxide rich slags, Newer ironmaking processes, Slag reduction theory, Optical basicity, Kinetic theory, Johnson - Mehl equation

A kinetic study on carbon reduction of iron oxide rich slags is reported in this investigation. The work has been carried out in two stages. Firstly, thermogravimetric experiments have been carried out using synthetic iron oxide rich slags in graphite / alumina crucibles. The slags have been reduced by solid graphite or carbon saturated iron or a combination of these. The kinetic data for graphite reduction have been analysed using the Johnson - Mehl equation and the effect of important process parameters, such as, temperature, basicity, initial amount of FeO in slag etc. has been studied. The kinetic data for reduction by carbon saturated iron were analysed using the first order equation.

The second series of experiments have been carried out using larger samples of industrial raw materials in a Tammann Furnace assembly. slags produced from pre - reduced iron ore and fluxes have been reduced by carbon saturated iron bath. The effects of different process parameters were studied in this case also and the kinetic data analysed using a first order equation.

The kinetic data have been expressed mostly in terms of FeO concentration of slag. It is, however, shown that more satisfactory kinetic analysis is possible by the use of the optical basicity concept which has been introduced in literature in recent years.