

## ABSTRACT

Due to mechanised mining huge quantities of iron ore fines and coal fines are generated and only a part of these run-off mines are utilised. The present investigation aims at the utilization of these fines to produce direct reduced iron (DRI).

The present study was carried out in two phases. In the first stage reduction studies were confined to packed bed mixtures. In the second, ore coal mixtures fluidized by air were studied. The effect of various process parameters on reduction of iron ore fines by coal fines were studied and empirical equations were developed which can predict time for a given range of degree of reduction for both packed bed and fluidized bed system. The kinetic aspects of reduction were also studied. It was observed that in both system the reduction was governed by first order reaction equation.

A mathematical model was also developed for packed bed reduction system, which can predict the degree of reduction with time at a given temperature and  $C_{fix}/Fe_T$  ratio for the reduction of iron ore fines by coal char fines. The predicted values match well with the experimental results conducted in the laboratory.

Some systematic studies were carried out on the carbon content of DRI produced. It was observed that for ore-coal

systems, under all experimental conditions, free carbon content is high in the initial stages of reduction. It is gradually consumed with time due to gasification. In the later stages mainly combined carbon is present.