

ABSTRACT

The measurement of hydrophilicity index and electro-phoretic mobilities of high ash, oxidised Indian non-coking coal used in this study indicated that the coal surface was oxidised. The coal samples were collected from the open cast mines.

The oxidised coal exhibits poor flotability. The flotability of such coal was enhanced by dissolution of the oxidised layer using aliphatic alcohol as evinced by flotation tests of this coal in Denver D-12 sub-aeration flotation cell.

Experimental data on the effects of process parameters and flotation reagents on non-coking coal flotation in the Denver flotation cell were collected to optimise these parameters.

Flotation column studies were also carried out with Indian non-coking coal to determine the effect of process variables, different types of diffuser and wash water distributor system on grade and recovery. The overall combustible recovery of the flotation concentrate in two stage flotation was 75-80% at the ash level of 13-14%.

The size of the bubbles generated in the flotation column were measured. The bubble size distributions were obtained in the absence of flotation. It was found that the bubble size distribution in both the flotation and cleaning zones followed the Rosin-Rammler equation which is normally used to describe the particle size distribution in crushing. This study also indicated that the bubbles in cleaning zone were always larger than those of the flotation zone.

A new approach has been made for developing axial dispersion model for predicting solids concentration in water and air phases of the flotation zone of the column. Experimental methods have been devised for evaluation of Peclet numbers for water phase (Pe_w) and air phase (Pe_{ar}), first order flotation rate constant K_1 . The Peclet

numbers were determined from residence time distribution (RTD) studies. A correlation has been proposed for the dispersion coefficient (D_w) of the water phase.

The axial dispersion model developed successfully predicted the solids concentration (Φ_w) and solid recovery (R_R) in the water phase of the flotation zone of the column.

KEY WORDS

Flotation, oxidation, hydrophilicity index, high ash non-coking coal, point of zero charge(PZC), electro-kinetics, hydrophobicity, flotation cell, flotation column, diffuser, wash water distributor, residence time distribution, theoretical model, Peclet number, dispersion number, variance, axial dispersion coefficient, water phase, air phase, solids concentration, solid recovery, flotation zone, cleaning zone, bubble size distribution, flotation rate constant, combustible recovery and grade of concentrate.