ABSTRACT

Flotation column (i.e. column flotation cell) is a simple and affordable means of achieving gas-liquid-solid contact and their separation. It has many important applications in various industrial as well as environmental problems (viz: industrial waste water treatment, de-inking of paper pulp, industrial de-oiling effluents, soil remediation, bio-leaching of mineral ores, upgrading mineral grades and recovery of coal fines).With the progressive depletion of known resources of good quality coal and minerals as well as the increasing demand of these minerals by different user industries, the emphasis has been shifted all over the world from selective mining to bulk mining followed by up-gradation to obtain the required quality of concentrate. During mining, blasting, crushing and grinding, large amount of fines are produced. These huge quantities of fines pose a threat to the mining area due to pollution. To dispose off these fines, one possibility is to reuse the same effectively and economically. Clean coal of high calorific value is also in demand for electricity production. Therefore current industrial practice is to recover and upgrade fines using suitable flotation technique. Among the flotation cells, flotation column is one of the alternatives to reduce the gangue content of fines because of its inherent characteristics (easier to operate, low space required, no moving parts etc) and advantages (a better product, a reduction in the number of stages of operation, less reagent costs, requires less maintenance etc). Literature review reveals that not much work has been done to get an insight of column cell. Hence, the present experimental works have been undertaken primarily to acquire new knowledge of the underlying phenomena and observable facts of column flotation using solid (coal and sphalerite). Present work explores the effect of operating variables (i.e. slurry velocity, gas velocity, slurry concentration and frother concentration) on hydrodynamics (i.e. gas holdup, bubble surface area flux and pressure characteristics) of flotation column. Correlations have been developed to predict the hydrodynamic parameters. Comparison among developed and published correlations has been made. In addition, effect of operating variables on metallurgical performance (i.e. recovery and grade) of flotation column has also been investigated. Relationship between flotation rate constant and hydrodynamic parameters has been studied and floatability parameter of coal has been estimated.