

Effect of Different Spargers and Operational parameters on Gas Hold-up in Column Flotation

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ABSTRACT

One of the most important parts of a column flotation is sparger which different kinds of it have an essential role on the amount of gas holdup. In this study the effects of spargers and operational parameters were investigated and analyzed. The experimental tests carried out in two phases (water-gas) circumstances. For gas holdup measuring in column three pressure sensors were used. Six factors and five levels were chosen as suitable factors and levels. Operational parameters such as gas rate, wash water rate, underflow rate and amount of frother; furthermore, different kinds of frother and sparger were studied. For design of experiments, Taguchi method is used and L25 array was selected. Gas rate as the first effective parameter has the greatest effect on gas holdup. The type of sparger is recognized as the second effective parameter. Different kinds of frother and amount of frother are also the third and fourth effective parameter. It is found that underflow and wash water rate, as the fifth and sixth parameter, had the least effects on gas holdup. Regarding the type of spargers, it was shown that Filter Sparger (FS), Sintered Glass Sparging Technology (SJST), Porous Spargers Technology (PST), Rubber Sparger (RS) and Spar Jet (SJ) had the greatest effect on gas holdup respectively.

Key Words: Columns Flotation, Sparger, Gas Holdup, Operational Parameters

INTRODUCTION

Flotation is one of the most important and common methods of mineral processing. In recent years, numerous researches and studies have been performed on flotation machines which among them, column flotation cells have been very prominent for optimization of parameters related to flotation [1,2,3]. Therefore, in this study, a column cell with completely optimized specification, has been designed and constructed on pilot scale at Amirkabir University of Technology (Iran-Tehran). The column's effective volume, diameter and height are, 25 liter, 10 and 400 cm (H/D ratio is 40), respectively. To realize optimal performance for the cell, storage tanks volume are assumed 100 liter. Material utilized for cell construction is transparent (Plexy glass). The designed system includes monitoring and automatic control equipment which are responsible for controlling of froth level in the flotation column [1,4,5], adjustment of wash water rate, required air for sparger, and the precise regional monitoring of gas holdup. In this study, the influence of sparger type on gas holdup is investigated. The most important operational parameters that affect gas holdup in a column are gas rate, wash water rate, underflow rate, and amount of frother. Therefore, type of

sparger and frother (as independent parameters) and operational parameters (as dependent parameters) are utilized for experimental design. It is worth noting that independent parameters are those which can be changed willfully by operator contrary to dependent parameters that need to be in acceptable operational limits for available column [1].

How to carry out experiments with column flotation cell

In this section, procedures that are needed to perform an experiment are illustrated. At first, feed with specified condition is prepared in feed storage tank and injected into column by a flow rate-varying pump (a peristaltic pump with controller). Then, required air is produced by a compressor and after passing through a flow meter, it is injected into column by a sparger. Finally, washwater is poured into column by a sprinkler after passing through a flow meter. It is necessary to wait for a while to reach a stable condition in the column. Whenever stable condition in two-phase (liquid-gas) part of column is obtained, the values of desired operational parameters can be observed on the monitoring system screen [1,6].