COM 2015 – 54TH RESEARCH ON CHARACTERISTICS OF GAS-LIQUID DISPERSION IN A KYF FLOTATION CELL

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ABSTRACT

Flotation has been widely used in the minerals processing industry. Good gas-liquid dispersion in flotation cell is the basis of efficient flotation. After gas is injected into flotation cell, gas would turn into tiny air bubbles as shear force produced by rotator-stator mechanism, and air bubbles would be dispersed in flotation cell. Efficient Flotation requires that air bubbles should be dispersed uniformly and the diameters and velocities of air bubbles should be suitable for mineral particles adherence. Hence, It is very important to study the characteristics of air bubbles and gas-liquid dispersion in the process of flotation.

The distribution of diameters, velocities and local gas holdup are significant characteristics of air bubbles in flotation cell. Characteristics of air bubbles in KYF flotation cell are studied using the method of the point conductivity probe. The method of the point conductivity probe is based on the different conductivities in air bubbles and liquid, and the point conductivity probe measures the changes in conductivities to obtain the distributions of diameters, velocities and local gas holdup of air bubbles. The effect of rotating speed and aeration rate on characteristics of air bubbles in flotation cell is investigated. Results indicate that the diameters of air bubbles are between 2-8mm without using reagent, and the velocities of air bubbles
are between 0.4-0.8 m/s. With increasing of speed, the velocities of air bubbles increase slightly, and the distribution of diameters have a little change. With increasing of aeration rate, the gas holdup is increased, and the velocities and diameters of air bubbles have no great change.

The characteristics of gas-liquid dispersion are investigated by using CFD. The Euler-Euler model and Multiple Reference Frame (MRF) model are used. The grid of the 0.2 m³ KYF flotation cell is hexahedron mesh. The gas holdup distribution in the center longitudinal section is revealed. The air bubbles dispersion in the middle and upper part of flotation cell is uniform. It would be helpful for air bubbles and solid particles collision. The gas holdup of the lower part of flotation cell is scarce, and it agrees with the observation in experiment. The gas would accumulate in blades of impeller, and it would decrease the power consumption of flotation cell. The rotating speed and aeration rate have great effect on gas-liquid dispersion of flotation cell. With increasing of aeration rate, the gas holdup of flotation cell will increase, while local gas holdup shows non-uniform distribution. The increasing of speed would improve gas-liquid dispersion. The CFD predictions on local gas holdup have good agreement with the experiment results. The air distributor which is a core component in flotation cell serves as gas-liquid dispersion. The effect of different gas outlet methods of air distributor on gas-liquid dispersion is studied. It demonstrates that gas outlet methods of "ring surface" and "vertical bar" could improve gas-liquid dispersion.

KEYWORDS

CFD; Flotation cell; Characteristics of air bubbles; Gas-liquid dispersion; Gas holdup