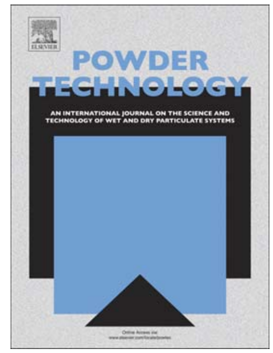

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Investigation of particle collection and flotation kinetics within the Jameson cell downcomer

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Abstract

A flotation model is used to calculate the flotation rate constants of methylated quartz particles as a function of particle diameter in the Jameson cell downcomer. This model includes the frequency of collisions between particles and bubbles as well as their efficiencies of collision, attachment, and stability. Especially, the turbulent energy dissipation of the downcomer is derived on the base of phase interaction of two-phase fluid model to avoid the complex and costly measurements of the fluctuations of the turbulent fluid velocities. The flotation rate constants calculated with the model produced the characteristic shape of the flotation rate constant versus particle size curve, with a maximum appearing at intermediate particle size. The low flotation rate constants of fine and coarse particles can be attributed to the low collision efficiency and low stability efficiency, respectively. The values of the calculated flotation rate constants are in good agreement with the experimental data. But the calculated flotation rate constant is slightly lower than experimental data which may result from some ignored interactions when the turbulent energy dissipation is derived. Therefore, more work is needed to identify the effects of turbulence in the Jameson cell downcomer.

Key words: Jameson cell; downcomer; turbulent energy dissipation; flotation rate constant

1. Introduction

The Jameson Cell was developed jointly by Mount Isa Mines and Prof. G.J. Jameson of Newcastle University in 1986 [1]. Since its invention, many Jameson Cells have been installed to treat a variety of ores, including lead, zinc, copper and nickel sulphides, as well as coal and industrial minerals[2]. Meanwhile, various collection mechanisms have been postulated within downcomer which is the key of Jameson cell, including thin-film migration, instantaneous collection, mixing zone

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