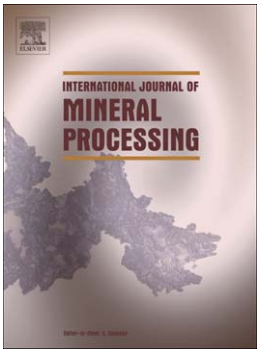

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Development of a Turbulent Flotation Model from First Principles and Its Validation

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Abstract

A first principle flotation model has been derived from the basic mechanisms involved in flotation. It consists of a set of analytical equations for various sub-processes such as bubble generation, bubble-particle collision, attachment, detachment, bubble coarsening, and froth phase recovery. A computer simulator based on the model can predict flotation from both hydrodynamic and surface chemistry parameters such as bubble size, particle size, energy dissipation rate, ζ-potentials, contact angles, *etc*. The model predictions are in good agreement with the flotation results obtained in both laboratory and pilot-scale tests. The model-based simulator can be used to design and diagnose flotation circuits. Typical input parameters include the size-by-class mineralogical composition of a feed, flotation cell characteristics, flow rates, and the types and dosages of reagents.

Keywords: Energy barrier; Disjoining pressure; Flotation rate equation; Bubble-particle interaction; Liberation; Contact angle.