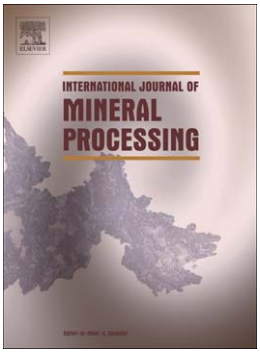

Flotation kinetic model with respect to particle heterogeneity and roughness

Alexander Nikolaev

PII: S0301-7516(16)30159-4
DOI: doi: 10.1016/j.minpro.2016.08.005
Reference: MINPRO 2937

To appear in: *International Journal of Mineral Processing*

Received date: 20 March 2016
Revised date: 26 June 2016
Accepted date: 10 August 2016

Please cite this article as: Nikolaev, Alexander, Flotation kinetic model with respect to particle heterogeneity and roughness, *International Journal of Mineral Processing* (2016), doi: 10.1016/j.minpro.2016.08.005

Flotation kinetic model with respect to particle heterogeneity and roughness

Alexander Nikolaev, Associate Professor
Department of Mineral Processing and Technogenic Raw Materials,
National University of Science and Technology "MISiS", 119049, 4 Leninsky prospect, Moscow, Russia,
Email: nikolaev@misis.ru

Abstract

This paper demonstrates the effects of both collector surface coverage and surface roughness on the work of particle-bubble adhesion and the probability of particle detachment from an air bubble. The work of adhesion and the probability of particle-bubble detachment change as a result of either surface coverage fraction or roughness ratio change or their combination.

A modified Yoon-Luttrel model for a flotation rate constant has been introduced with respect to surface heterogeneity and roughness. The work of particle-bubble adhesion is calculated using various surface coverage of collector on mineral surface and its roughness ratio and the probability of particle detachment from the air bubble has been estimated. These simulations have been made for galena and fluorite particles.

Key words: flotation kinetic, surface coverage, heterogeneity, roughness, probability of detachment, flotation rate constant, fluorite, galena

Introduction

Froth flotation is a widely used process to separate valuable minerals from gangue and valuable minerals from each other. It is based on the difference in physico-chemical surface properties of the particles. In general, flotation processes can be described by means of three sub-processes: particle–bubble collision, particle–bubble attachment and particle–bubble detachment (Bogdanov, 1990, Nguyen et al, 1997). In order to attach to a bubble the particle needs to obtain a certain degree of hydrophobicity that can be enhanced by adding collectors and controlling the hydrophilic oxidation products on mineral surface. Particle hydrophobicity, bubble charge and hydrodynamics may vary in flotation and determine if the particle-bubble attachment-detachment occurs (Bogdanov, 1990, Waters et al, 2008). These factors affect flotation kinetics. When air bubbles are introduced into a flotation cell, containing a flotation pulp, hydrophobic mineral particles are attached to the bubbles while hydrophilic ones are left in the cell. Flotation kinetics depends on the rates of bubble-particle aggregates formation, their stability and transferring to the top of the pulp of the flotation cell (Sutherland, 1948, Bogdanov, 1990).