A 3D coupled model of turbulent forced convection and diffusion for heat and mass transfer in a bioleaching process

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Abstract

The bioleaching unlike the leaching is a process catalyzed by bacteria. Generally, the mine material containing is previously agglomerated to build piles. A three dimensional mathematical model to describe the fluid mechanics, mass and heat transport that consider inside the pile source terms for oxidation reaction, biological kinetic, and oxygen depletion due to methanogenic bacteria (15–45 °C), is presented. The Reynolds average equation with the κ–ε turbulence model was considered for the air surround it. An experimental leaching pile of tailing agglomerated was performed and built in order to obtain data with which to compare the numerical results. The results of computational simulations using the proposed mathematical model and the finite volume method were successfully validated comparing it with those experimental results. The numerical simulation allows to describe the internal effect of the bacteria on temperature, oxygen concentration and acid evaporation for a pile in field with bioleaching process.