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Investigation into the Effectiveness of Bacillus Mucilaginosus in Liberation of Platinum Group Metals Locked in Silicates

Authors : Nokubonga G. Zulu, Bongephiwe M. Thethwayo, Mapilane S. Madiba, Peter A. Olubambi

Abstract : In South Africa, PGMs' metallurgy industry is now leaned on the Upper Group 2 (UG2) reef for the beneficiation of 4PGEs (Platinum, Palladium, Rhodium, and Ruthenium). The current effective beneficiation method is direct froth flotation which uses the hydrophobicity of liberated valuables minerals to carefully float them while hydrophilic gangue minerals report to the residue. PGMs are known to be associated with base metal sulphides which are hydrophobic; however, approximately 25% of PGMs from UG2 are associated with hydrophilic silicates, which results in high PGMs grade in the flotation residue. Further, the smallest size in which UG2 PGMs occur is approximately 9 microns which demands high grinding for liberation, imposing energy and cost implications. The use of Bacillus mucilaginosus to liberate PGMs using Bio-leaching of PGMs bearing Silicates is a promising cost-effective, energy-saving, and green solution to liberate PGMs locked in silicates. This is due to the ability of Bacillus mucilaginosus to generate extracellular polysaccharides (EPS) that are responsible for the leaching of silicate minerals. The bioleaching is done at a laboratory beaker using a cultivated Bacillus mucilaginosus as a lixiviant. The bioleaching residue is expected to have a reduced particle size due to silicate consumption, which reduces the need and cost associated with a secondary milling circuit. Moreover, the grade of the bioleaching product is increased since the silicates (gangue minerals) are consumed by Bacillus mucilaginosus; this serves as a pre-concentration step. This paper discusses an alternative liberation and pre-concentrating technique of PGMs that are associated with silicates using Bacillus mucilaginosus leaching to dissolve silicates.

Keywords : Bacillus mucilaginosus, bio-leaching of PGMs bearing silicates, liberation of PGMs, pre-concentration of PGMs
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