

Investigation of the behaviour of platinum-group minerals and base metals sulphides during flotation of UG2 ore

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ABSTRACT

Platinum-group element (PGE) mining in South Africa originally concentrated on the Merensky reef (MR) in the western limb of the Bushveld igneous complex. However, most of the mineable MR ore in the western limb has been extracted and therefore the mines are now focussing on the Upper Group 2 chromitite (UG2) ore. The increased PGE production from the UG2 ore poses challenges to the beneficiation process because of the ore's high chromite content and smaller (2 μm to 30 μm) platinum-group mineral (PGM) size as compared to the fairly large (10 μm to 200 μm) grains in the MR.

Traditionally, PGMs have been recovered from the MR ore by sulphide flotation and this sulphide flotation is still used for the UG2 ore with continuing improvements to the circuit. Due to the uncertainty of the mode of occurrence of the PGM in the UG2 ore, this research project is using mineralogy to optimise the PGE beneficiation. We have investigated the behaviour of the PGMs and base metal sulphides (BMS) during flotation, as well as looked at whether flotation of the BMS can be used as a proxy to predict the flotation behaviour of the PGM. The work is ongoing.

This investigation is being done on a primary circuit of a UG2 concentrator plant. The mineralogy of the primary feed, various concentrator cells and tailings was analysed using a mineral liberation analyser (utilizing energy dispersive X-ray fluorescence (XRF)) and X-ray diffraction for mineralogical information, and wavelength dispersive XRF for chemical assays of the bulk samples. To date, it appears that 75% of the total PGMs fed into the flotation cells is in a liberated form, while 16% is associated with the BMS and 9% with the gangue (silicates). The results show that both BMS and PGMs respond in a similar way to sulphide flotation, but behave differently in some ways, because of differences in their grain size distributions.

Key words: UG2 concentrator, Flotation, PGM, BMS.