FLOTATION OF AURIFEROUS PYRITE USING A MIXTURE OF COLLECTORS

By

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…now unto Him that is able to do exceeding abundantly above all that we ask or think, according to the power that worketh in us….

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ABSTRACT

The effects SIBX/C_{10} (or C_{12}) TTC mixtures on flotation response of pyrite, gold and uranium from Anglogold Ashanti's No 2 Gold Plant feed were investigated. In batch flotation tests where TTC was dosed from aged 1% wt stock solutions, synergism was shown to occur in gold flotation at 25 mole percent C_{12} TTC and in uranium flotation at a similar dosage of C_{10} TTC. With commercial C_{12} TTC, 8 mole percent recorded the highest uranium and gold recoveries. The SIBX/C_{12} TTC mixture had a greater effect on gold than on uranium. When C12 mercaptan replaced the TTC in SIBX mixtures, rates and recoveries decreased at all levels.

Kinetics and recovery with a mixture of 92 mole percent SIBX and 8 mole percent commercial C_{12} TTC gave a better flotation activity than obtained with SIBX alone. A combination of SIBX and an aged 1% wt solution of TTC lost activity when compared to that of SIBX and commercial TTC. This was attributed to the hydrolysis of TTC.

Micro-probe analysis, back-scattered electron images, and EDS analysis showed that all the uranium recovered in flotation concentrates was associated with either pyrite, galena or a carbonaceous material (karogen). This was attributed to the flotation of the uranium oxide minerals brannerite and uraninite.

Conditioning at pH values between 1.9-3.7 improved kinetics of gold, sulphur and uranium collection, but sulphur and uranium final recoveries were lower and gold final recovery was higher than the standard.

In the presence of 0.001M cyanide, equivalent to 70g/t copper sulphate failed to activate pyrite at both pH 5.5 and pH 7.2. At a similar molar dosage lead nitrate did activate pyrite at pH 5.5 but not at pH 7.2.

Keywords: Froth flotation, Auriferous Pyrite, Trithiocarbonate collectors, Cyanide, Lead nitrate, Copper sulphate, Mineralogy, pH

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