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## CHAPTER 1

### INTRODUCTION

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Gold in the feed to AngloGold Ashanti's North No. 2 Gold Plant is recovered by floating its pyrite host using sodium *iso*-butyl xanthate (SIBX) as a collector, Dowfroth 200 as a frother, copper sulphate as an activator, GEMPOLYM GM4 as a depressant and SO<sub>2</sub>-containing calcine water as a cyanide oxidant and pH modifier.

Trial runs using a combination of 96.5 mole % SIBX and 3.7 mole % C<sub>12</sub> trithiocarbonate (TTC) collector, firstly in the laboratory and then at a full plant scale were conducted over a ten-month period (Davidtz, 2002). Results recorded from this work showed an increase in the recovery, of gold, uranium, and sulphur. Interest in the role played by the TTC collectors has led to research by The Department of Materials Science and Metallurgical Engineering at the University of Pretoria in conjunction with the Department of Metallurgy at the University of Utah. Some of the areas of interest include the effect of functional group changes O-CS<sub>2</sub> (xanthates) versus S-CS<sub>2</sub> (trithiocarbonates) with respect to auriferous pyrite flotation response and definition of relevant mechanisms using electrochemistry and spectroscopy. The present study is aimed at quantifying the effect of SIBX/TTC collector mixtures in the flotation of pyrite, gold and uranium from No. 2 Gold Plant feed. Attention is also given to the factors contributing to the flotation of uranium. The objectives of this work are:

1. To optimise the SIBX/TTC (C<sub>10</sub> and C<sub>12</sub>) mixtures for oxidised pyrite flotation and study the effect of ageing TTC on flotation response.
2. To compare the activation of pyrite by Cu (II) and Pb (II) in the presence of cyanide.

3. To determine the probable mechanisms contributing to uranium flotation.
4. To determine the effect of conditioning pH on flotation