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Optimization Flotation Process Using Two Types of Collectors at PT. Florrea Indonesia

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Abstract

The tailings slurry used in this research originated from company X in Kuala Lipis, Pahang, Malaysia. The primary objective of this study is to determine the percentage of recovery, concentrate content, and Au concentration ratio in the tailings slurry. The research employs a quantitative method involving flotation testing. The flotation process involved two sets of experiments: one without the FX2 collector (tests 1 and 2) and another using both the F7042W and FX2 collectors (tests 3 and 4). dxThe research findings revealed that the percentage of Au recovery in single-collector flotation using FX2 (test 1) was 56.47%, with a concentration ratio of 19.78. In test 2, it was 52.59%, with a mass concentration ratio of 21.57. Meanwhile, the percentage of Au recovery in dual-collector flotation using F7042W and FX2 (test 3) was 68.77%, with a concentration ratio of 16.55, and in test 4, it was 69.45%, with a concentration ratio of 16.93. Based on the results of this research, it can be concluded that the flotation process employing two collectors, namely F7042W and FX2, as investigated in this study, was successful because percent recovery, concentration ratio, and Au content in the concentrate compared to single collector flotation.
Keywords: Tailing, Recovery, Concentrate, Flotation, Mineral Processing

Introduction

Gold is one of the most sought-after precious minerals in the world, but gold needs to go through a long process, starting from mapping, mining, mineral processing, refining, until pure gold is obtained. pure gold (FJ Alguacil, 2016). Gold found in nature has several types of gold ore, namely free milling, refractory, and telluride gold ore (Forrest ~ et al., 2001). One of the methods for refining gold refining is the hydrometallurgical process. The process hydrometallurgical process works by separating valuable metals using reagents or chemical solutions reagents or chemical solutions (Naklicki et al., 2002).

One of the extraction techniques applied in industry is the Resin in Leach (RIL) method (Azizitorghabeh et al., 2021). In this approach, the gold ore sample flows through column containing an ion exchange resin (Choi et al., 2020). The resin has a high affinity for gold, so when the ore sample interacts with the resin, there is gold absorption by the

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resin (Azizitorghabeh et al., 2023). Once the resin is saturated with gold, the next step involves leaching of the resin to separate the gold from the resin.

Tailings produced from the extraction process often contain preg-robbing gold, which is ore containing carbonaceous materials such as organic carbon, carbonates and clay (Corin et al., 2022). The presence of organic carbon makes gold that was previously dissolved in the cyanide complex solution becomes adsorbed back into the concentrate not taken up in the concentrate and eventually wasted with the tailings (Fedotov et al., 2022).

One of the methods used to increase the gold content in tailings before the refining stage is flotation (Afolabi et al., 2013). Recovery and final concentrate become one of the main focuses in the separation process (Soemali et al., 2022). profitability of the separation process in a company. Company X in Kuala Lipis, Pahang, Malaysia, which is the focus of the study, has experienced a decrease in recovery which has caused heavy losses (Cheng & Iwasaki, 1992). Therefore, the researcher tried to get a higher recovery. The method chosen was by using the flotation process (Hassanzadeh & Hasanzadeh, 2016).

Research Methods

In this study researchers varied the use of one collector, and used two collectors to get an increase in the optimum recovery of the gold flotation process from tailings slurry. The synergistic effect of using dual collectors for feeds containing free gold and sulfide minerals has an increase in recovery of up to 20%. The reagents to be used are Florrea 7042W as primary collector, Florrea X2 (xanthate) as secondary collector, and Florrea 530X for frother. Soda Ash will be used to adjust the desired pH.

Data collection in this research was in the form of the most optimal use of reagents when viewed from the recovery and grade of the taling slurry flotation process from the most optimal leaching process for each combination of collectors used. Then a discussion and analysis is made about which one is more optimal in terms of grade and recovery for collector use.

So this research is to analyze the effect of variations in the use of collectors in the flotation process on the increase of gold from the tailings slurry leaching process (Lee et al., 2022).

Results and Discussion

Initial gold content or head grade needs to be tested levels, using Atomic Absorption Spectroscopy or AAS. Testing is done by taking a small sample of the feed that has been homogenized. homogenized. The results of the grade analysis on the flotation feed is 0.32 ppm.

Content analysis of concentrate and tailings is carried out to determine and calculate recovery calculate recovery. The data below presents the amount of concentrate

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and tailings in the flotation process in ppm and in weight or grams. From the results of AAS test results, the values obtained are as in Table 1

Table 1 Gold Content of Flotation without and with F7042W

Sample	Flo Concentrate (ppm)	Flo Tailing (ppm)	Weight Concentrate (g)	Weight Tailing (g)
Test 1	3.25 ppm	0.17 ppm	55.6 gram	912.63 gr
Test 2	3,3 ppm	0,16 ppm	51 gram	949 gram
Test 3	3,31 ppm	0,14 ppm	66,48 gram	933,52 gram
Test 4	3,42 ppm	0,12 ppm	64,98 gram	935,02 gram

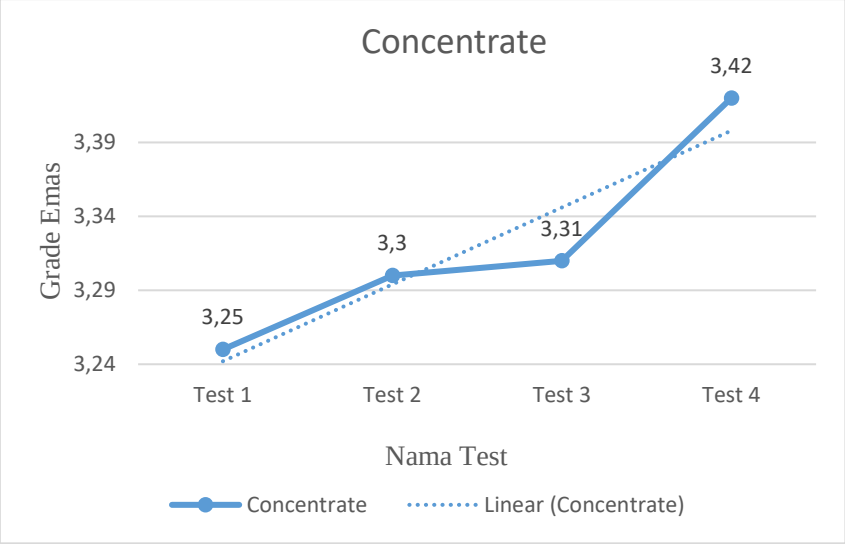

Figure 1. Concentrate in the Flotation Process

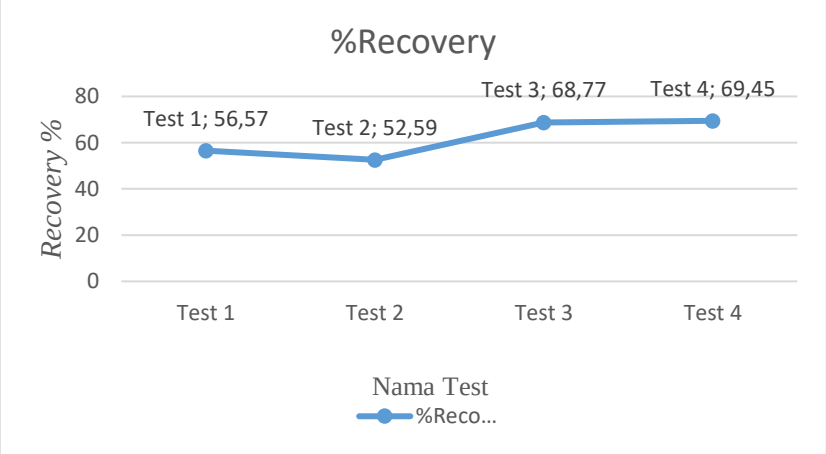

Figure 2. Increase in % Recovery

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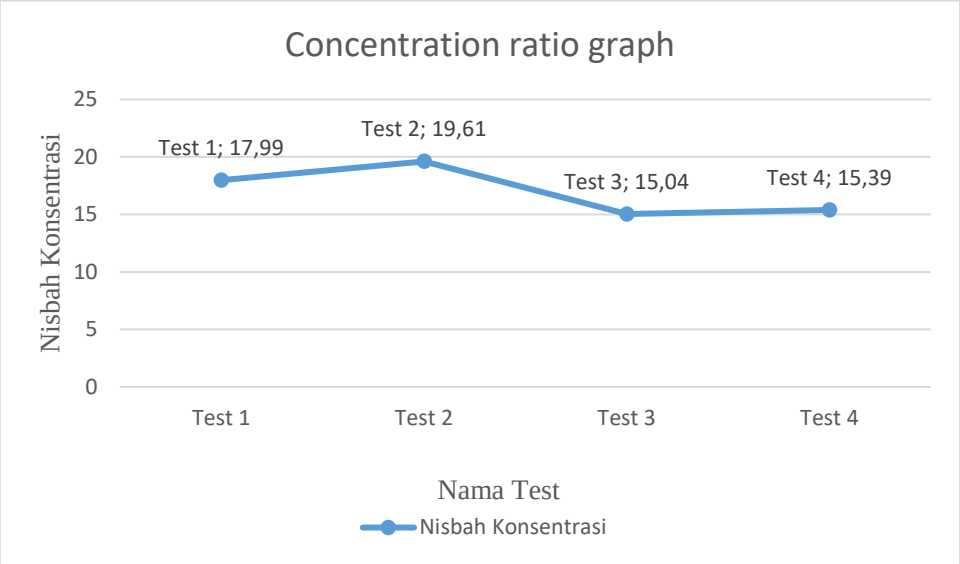

Figure 3. Concentration ratio graph

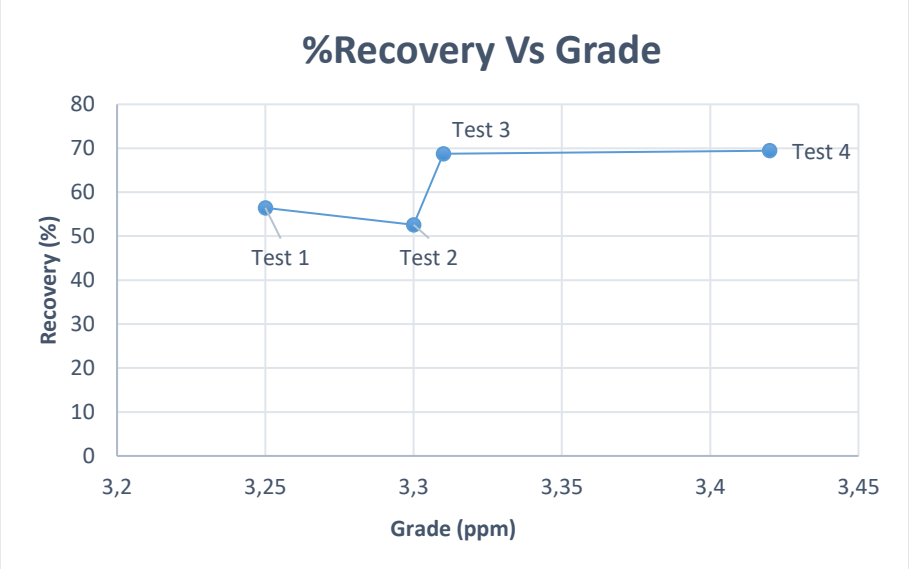

Figure 4. % recovery vs grade

After obtaining data on the content and weight of the head grade, concentrate and tailings, it is possible to calculate the recovery from the flotation process without using the flotation process tailings, it is possible to calculate the recovery from the flotation process without using the reagent collector F7042W. Recovery Test 1 is 56.47% and recovery Test 2 is 52.59% (Figure 2).

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Liberated gold is aerophilic, so it can float more easily. However, because the content of the Feed is not only gold only, then using a collector such as FX2 which is a xanthate group will help with recovery and increase recovery. Because this collector helps to give temporary aerophilic properties to sulfide minerals. So gold that binds to sulfide minerals will be more easily lifted through the flotation process. flotation process. However, the use of reagents and dosage greatly affects the flotation process, if too much or too little is used, it will affect the final concentrate and recovery from the flotation process. concentrate and recovery from the flotation process. Therefore it is necessary to conduct research the most optimal combination.

Analysis of levels in concentrates and tailings is carried out to determine and calculate recovery using a reagent collector. From the results of AAS test results for Test 3 flotation Concentrate 3.31ppm tailing 0.14ppm and for Test 4 flotation Concentrate 3.42ppm and Tailing 0.12ppm (figure 1).

After obtaining data on the content and weight of the head grade, concentrate and tailings, the recovery from the flotation process can be calculated. Recovery Test 3 is 68.77% and recovery Test 4 is 69.45% (figure 2).

recovery from tests using two collectors increased compared to using one collector, namely 68.77% in test 3 and 69.45 in test 4, this is in accordance with the theory that says that the use of dual collectors can have a higher %recovery, when compared to using them separately that the use of dual collectors can have a higher %recovery, when compared to using separately, an example of the use of synergistic effects of dual-collector reagent schemes by using xanthate and dithiophosphate group collectors using xanthate and dithiophospahte group collectors as used in this study. The %recovery increase in the use of two collectors increased, from test 1 and test 2 which used a single collector of the results were lower than those of test 3 and test 4.

It can be seen that the recovery from the test using two collectors increased compared to using one collector, namely 68.77% in test 3 and 69.45 in test 4, this is in accordance with the theory which says that using double collectors can have a higher recovery%. when compared with using them separately, for example the use of synergistic effects of dual-collector reagent schemes using xanthate and dithiophospahte collectors (FJ Alguacil, 2016), as used in this research. The increase in recovery percentage when using two collectors increased, from test 1 and test 2 which used one collector the recovery was lower compared to test 3 and test 4, which used two collectors. To see a graph of the increase in recovery% from test 1, test 2, test 3, and test 4, see Figure 3

In the flotation process, there are three parameters for determining the efficiency of the process, namely recovery, final concentration and concentration ratio. In terms of recovery and final concentrate, the higher the better, while the lower the concentration ratio, the better. The first thing to look at is the recovery, because con grade can be increased by extending the floatation plant circuit, using mechanical cleaning flotation,

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or using column flotation. In tests number 3 and number 4, it was seen that recovery increased and concentrate levels also increased, which was caused by the use of two collectors as flotation reagents.

F7042W is a collector reagent, which in this flotation experiment acts as a primary collector, because of its properties which help make the minerals that you want to increase using the flotation process more stable and more of them are taken. Seen from table 1 the tailings in test 3 and test 4 were 0.14 ppm and 0.12 ppm respectively, lower than the tailings of the flotation experiment without using two collectors, which means that the synergy of using two collectors 7042W and using only one collector. Increased grade and also recovery% from tests using two collectors compared to using one collector (figure 4).

Conclusion

The research results show that the percentage of Au recovered in flotation with one collector using FX2, namely test 1 was 68.77% with a concentration ratio of 19.78 and in test 2 it was 52.59 with a mass concentration ratio of 21.57. Meanwhile, the percentage of Au recovered in flotation with two collectors using F7042W and FX2, namely test 3 was 68.77% with a concentration ratio of 16.55 and in test 4 it was 69.45% with a concentration ratio of 16.93. From the results of this research, it can be concluded that the flotation using two collectors, namely F7042W and FX2, which was carried out in this study, was successful because the % Recovery, and concentration ratio, and followed by au content in the concentrate were better than flotation using one collector.

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