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The potential control technology in the application of selective regrinding of flotation middlings to improve the chalcopyrite sorting index

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ABSTRACT

With the selective regrinding of flotation middlings, the pulp potential tends to vary. The potential of the pulp after regrinding was adjusted by adding the potential adjusting reagents in order to improve chalcopyrite flotation index. Potential changes in pulp were measured before and after regrinding, then study the relationship between pulp potential and flotation index, and carry on Closed-circuit test for primary process and the selective regrinding of flotation closed-circuit test point Regulation Technique test to Mine samples collected from Wushan Copper. It was found that new processes improve the final concentrate grade of 1.39% compared with the original process, and ultimately improve the recovery rate of 0.65% after adopt new technology.

KEYWORDS

The selective regrinding of flotation middlings; Pulp potential; Potential regulation; Return order; Flotation index.



INTRODUCTION

The selective regrinding of flotation middlings technology is proposed by Professor Peng Hui Qing in 1996. After years of development, it has formed a complete theoretical system^[1-4]. He change the flotation process from Simple sequential returns process to comprehensive process containing grinding and flotation processes. From the beginning of the last century, scientists from various countries electrochemical have begin the study of the flotation process, and also establish relevant theoretical system^[5-16]. Combining the selective regrinding of flotation middlings with Flotation electrochemical theory in flotation, is not only new developments in the selective regrinding of flotation middlings technology, but also improvement of the electrochemical theory system of flotation. It is one of the new direction of Mineral Processing development.

Ore property

The ore is come from the Wushan Copper production site, carry on the XRF whole element of the test, measurement results are shown in TABLE 1.

TABLE 1 : ore XRF analysis

composition	Cu	S	Fe	Si	P	Mg	K	Ca	Ti
content (%)	0.85	11.73	16.64	25.89	0.12	3.72	0.43	18.93	0.21
composition	Mn	Al	Na	Zn	PbO	SrO	BaO	MoO3	LOI
content (%)	0.25	7.05	0.27	0.16	0.09	0.01	0.02	0.01	8.37

TABLE 1 shows, Wushan Copper ore contains with copper, sulfur, iron, while also containing other elements such as silicon, calcium, magnesium, aluminum. the main collector of flotation is copper. iron, magnesium, aluminum and other silicate minerals, are excluded objects.

Pulp potential measurement methods.

This test adopt a three-electrode system with saturated KCl solution as an electrolyte and calomel electrode as Auxiliary electrode, Mineral electrode is used as working electrode. The working electrode was immersed in 3 min, after recording the value of equilibrium potential. Use different types of sandpaper polishn before working electrode measurements and, finally, polished to a mirror with a polishing machine, cleaning, ensure that the electrode surface clean.

Relective regrinding of flotation potential research

The ore in this study is from Wushan Copper production site, the test flotation process using live processes in Wushan Copper, that is, rough concentrate and return tailings II need regrinding, each other middlings return to the mine are taking sequential processes, Among them, All the mines are taking progressive return process, pharmaceutical dosage and pulp density and other indicators are consistent with the site.

1. Determination of rough concentrate regrinding closed circuit pulp potential

According to Wu shan Copper Mine site processes ore obtained after the grinding fineness of -0.074 mm content of 65 % flotation ore, the fineness of the rougher concentrate regrinding -0.074 mm content of 92 %. reagent system of rough concentrate I are: lime dosage 3 Kg / t, collector (butyl xanthate) dosage 50 g / t, frother dosage of 20 g / t; reagen system of concentrate I is fine for some agents: lime dosage 1 kg / t, without the collector and frother, the entire process using closed form to measure pulp potential. Specific test process shown in Figure 1. Graph alphabetical marked points pulp potential measurement point. Pulp potential was measured as shown in TABLE 2.

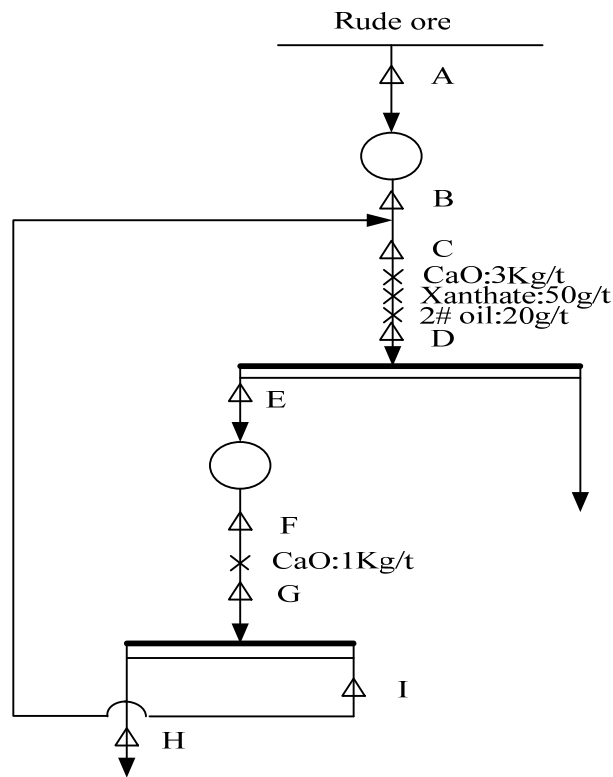


Figure 1 : rougher concentrate regrinding potential measurement flowchar

TABLE 2 : Rougher concentrate regrinding closed circuit potential test result (mV)

times Test point	1	2	3	4	5
A	483	485	480	483	482
B	478	477	473	478	478
C	478	427	411	407	408
D	350	325	319	319	317
E	348	324	319	318	316
F	389	369	358	354	352
G	282	265	262	262	260
H	281	265	261	261	260
I	283	266	263	264	261

Determined by closed-circuit test pulp potential TABLE 2 shows: After rough concentrate regrinding, Pulp potential improve certain extent, in the process of re-grinding O_2 to enter the pulp and occurs oxidation reaction, raising pulp potential,

Meanwhile xanthate absorbed in ore surface can detached from the surface of the ore and occur degradation reactions, improving the pulp potential in the grinding process; In the course of the entire closed progress because of the alkaline slurry returns, reducing the amount of water, the whole process of alkaline of lime slurry obtained accumulate, making each test point of the entire process equilibrium is stronger than initial test points, pulp potential equilibrium test points is lower than the initial pulp potential.

2. research of rough concentrate regrinding Potential regulation and sorting index

In accordance with the flow chart 1, Adjusting the potential of the slurry to form a stable closed Before the pulp test point G, Pulp potential in G-spot are 100 mV、 150 mV、 200 mV、 250 mV、 300

mV、400 mV、500 mV、600 mV、700 mV, Measuring concentrates job recovery and grade of chalcopyrite and pyrite in selection section, Ultimate relationship between pulp potential and mineral sorting indicators are shown in TABLE 3. the relationship between Pulp potential mineral recovery and shown in Figure 2, the relationship between the mineral grade and recovery of pulp is shown in Figure 3.

TABLE 3 : Reality direct regrinding mineral test results of pulp potential sorting index (mV)

Electric potential (mV)	Concentration Ore		Productivity (%)	Chalcopyrite		Pyrite	
	Cu grade (%)	Fe grade (%)		Cu Grade (%)	Recovery (%)	Fe Grade (%)	Recovery (%)
100	4.77	22.98	9.22	21.11	40.80	11.02	4.42
150	4.80	23.08	13.21	19.21	52.87	18.67	10.69
200	4.75	23.25	23.89	14.11	70.97	23.96	24.62
250	4.77	23.13	35.31	10.78	79.80	31.25	47.71
300	4.76	23.02	45.17	8.55	81.14	33.22	65.18
400	4.77	23.07	55.64	7.22	84.22	27.00	65.12
500	4.78	23.16	52.11	7.17	78.17	25.43	57.22
600	4.77	22.99	49.48	7.28	75.52	24.56	52.86
700	4.75	23.15	34.21	8.76	63.09	23.78	35.14

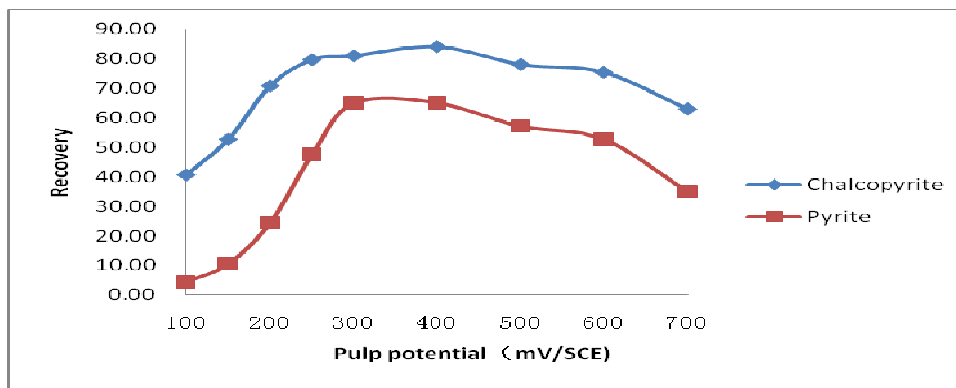


Figure 2 : Relationship between rougher concentrate regrinding pulp potential and job recovery

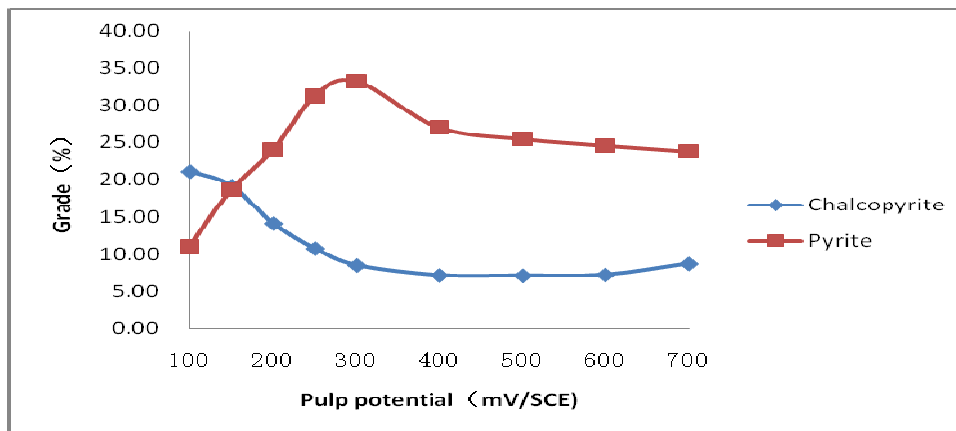


Figure 3 : Relationship between rough concentrate regrinding pulp potential and grade graph

From TABLE 3 and Figure 2, Figure 3, when the pulp potential is 200 mV-700 mV, chalcopyrite job recovery is relatively high, pulp potential is 250 mV-600 mV, pyrite recovery operations is relatively high, so chalcopyrite and pyrite is have a better Collectors effect when the pulp potential is 200 mV-250mV,which is not conducive to separation both chalcopyrite and pyrite. chalcopyrite job recovery was significantly higher than pyrite when the pulp potential is 200 mV-250mV. chalcopyrite grade is decline With the rise of pulp potential while pyrite grade is pyrite grade with the rise of pulp potential. Considering the sorting index of chalcopyrite and pyrite under various potential comprehensively, found in the potential of 200 mV-250 mV, it can get a better flotation index of chalcopyrite and pyrite suppression index. At this point, the final product grade of chalcopyrite was significantly higher than copper when the grade of pyrite was significantly lower than iron. Considering Chalcopyrite concentration is a workflow-oriented to improve copper grade, it is suggested that pulp potential of about 200 mV-250 mV is the best range of featured segment potential regulatory.

closed-circuit test

In this study, carry on the Original process closed-circuit and closed test after selective regrinding of flotation middlings Electrochemical Control Respectively, selective regrinding of flotation middlings Electrochemical Control is control potential After the middlings regrinding, I adjusting the pulp potential to 225 mV, carrying on flotation test. Test flow chart shown in Figure 4, the mass number flowchart shown in Figure 5 and Figure 6. The test results are shown in TABLE 4 and TABLE 5.

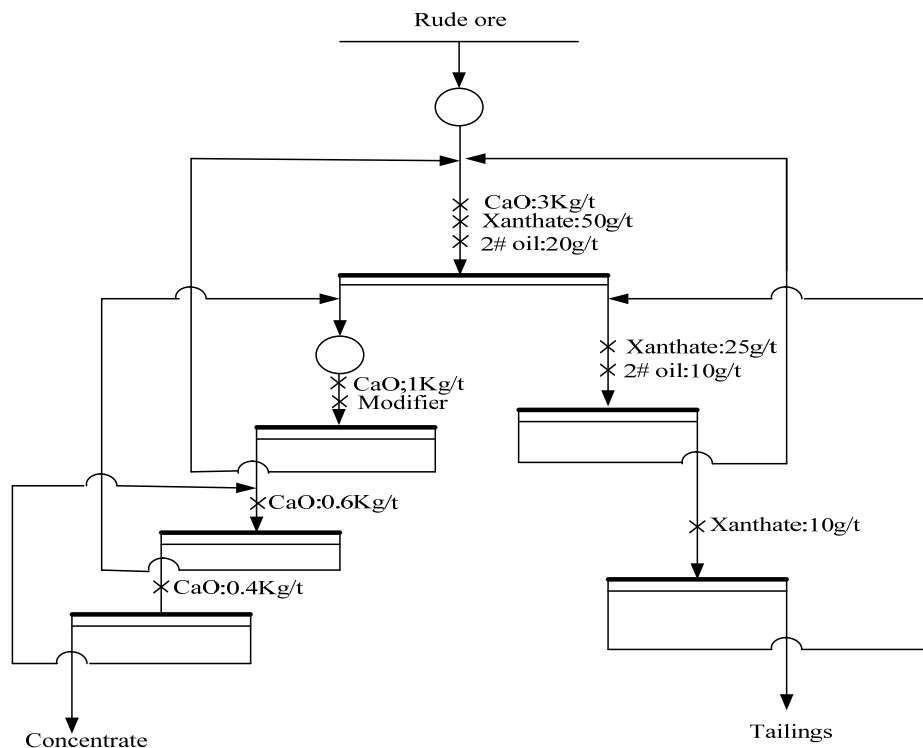


Figure 4 : Closed flowchart

TABLE 4 : Closed original process test results

	yield (%)	grade (%)	Recovery (%)
Concentrate	3.45	22.07	89.46
tailing	96.55	0.093	10.54
Ore	100.00	0.85	100.00

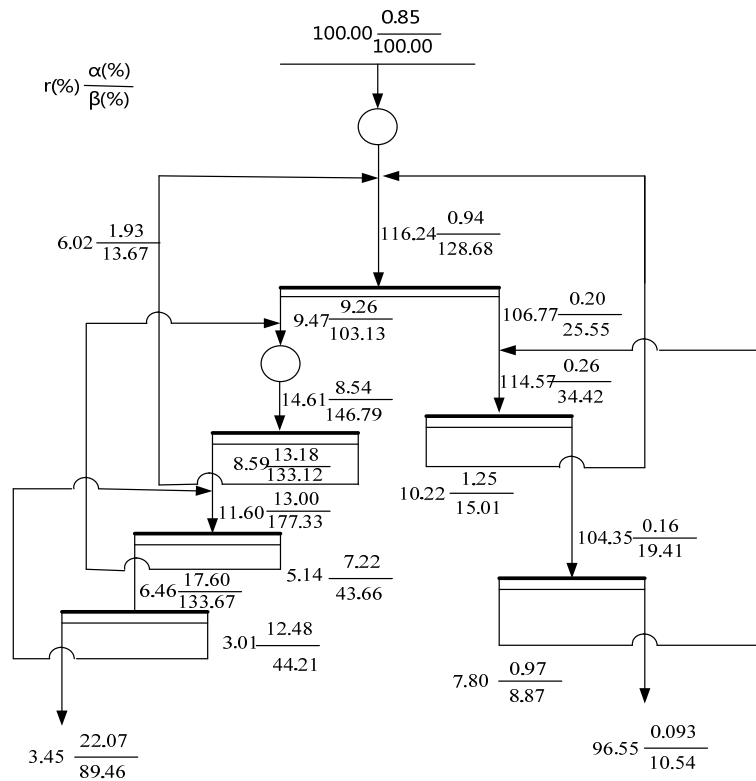


Figure 5 : Original process close quantity-quality flow-sheet

TABLE 5 : the selective regrinding of flotation middlings Electrochemical controlled closed-circuit test results

	yield (%)	grade (%)	Recovery (%)
Concentrate	3.26	23.46	90.11
Tailing ore	96.74	0.087	9.89
ore	100.00	0.85	100.00

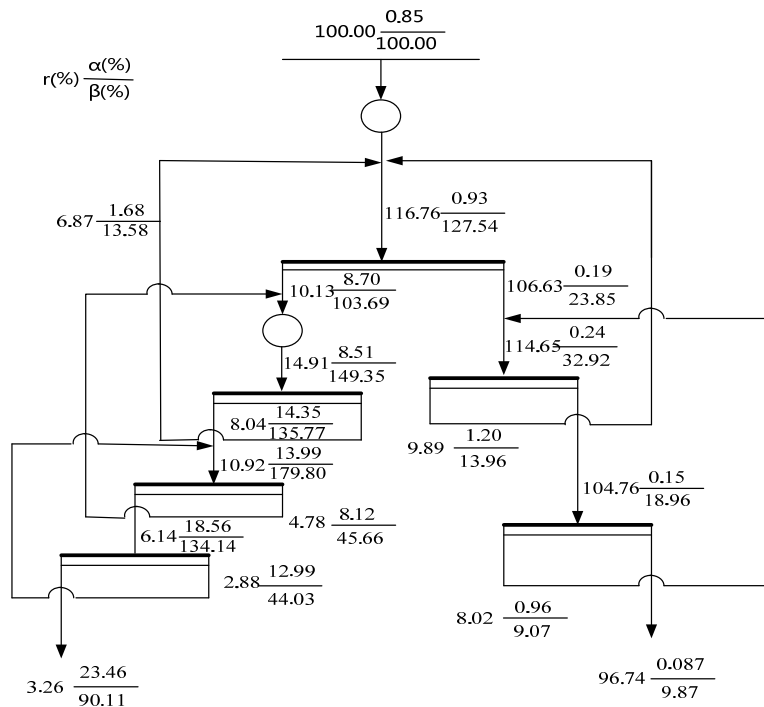


Figure 6 : the selective regrinding of flotation middlings Electrochemical controlled quantity-quality flow-sheet

According to the test results of two closed-circuit, adopting selective regrinding of flotation middlings Electrochemical Control is improve the final concentrate grade of 1.39% compared with the original flow, and ultimately improve the recovery rate of 0.65%, Describing that the new process can significantly improve the flotation effect. Compare the flotation index of two processes before and after adding potential control technology, finding that the copper grade of concentration I is increased by 1.17% compared with the process without adjustment, while copper recovery increased by 2.65%, the result illustrates that adjust potentiometer of flotation pulp to an appropriate value can increase sorting index of flotation after regrinding.

SUMMARY

1. When adopting the selective regrinding of flotation middlings technology, Pulp potential increased a certain extent after rough concentrate regrinding, In the process of re-grinding O_2 enter the pulp and oxidation reaction occurred. pulp potential was improved by combined effect of these two reactions

2. Carry on potential regulate and flotation experimental research to rougher concentrate pulp after regrinding, It can be found that when the pulp potential is the 200 mV-250 mV, fine I have a better flotation.

3. Carry on the Original process closed-circuit and closed test after selective regrinding of flotation middlings Electrochemical Control, adopting the new flow is improve the final concentrate grade of 1.39% compared with the original flow, and ultimately improve the recovery rate of 0.65%.

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