Research on Collecting Copper from Chalcopyrite by Flotation in Yunnan

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Abstract. Based on the properties analysis of the chalcopyrite and the phase analysis of the chalcopyrite, collecting copper from the chalcopyrite by flotation was determined. The effects of grinding fineness, the dosage of dispersant and the dosage of collector were researched. The grinding fineness as 90%, water glass as dispersant 400 g/t and xanthate as collector 170g/t, two-stage scavenging and three-stage cleaning, at this conditions, 22.65% copper was obtained with a recovery of 89.85%. The good mineral processing index was got.

Introduction

As the important elements of modern industrial production, copper is widely used in materials, pharmaceuticals, chemical, steel, energy and other fields (D. Xixiang, 2006, Z. Chunshu, 1988, Z. Chunshui, 1998, D. Xixiang, 1986). Copper has an important economic value. In china the main raw material of copper is chalcopyrite. In recent years copper is already in short a supply metal with technological and economic development. Due to the continuous exploitation of mineral resources, the ore is more difficult to process with ore increasingly poor, fine and miscellaneous.

There is a place with rich chalcopyrite resource in Yunnan province. Based on the properties analysis of the chalcopyrite and the phase analysis of the chalcopyrite, we study on mineral processing technology of this chalcopyrite and obtain a qualified concentrate of copper. It will be benefit on making use of this chalcopyrite recourse.

Ore Property

Table 1.1 Multi-element analysis of ore %

element	S	Cu	Pb	Zn	CaO	MgO	Al_2O_3	SiO_2	Fe	C
content	5.87	0.70	0.05	0.028	0.98	0.98	6.12	39.98	0.8	0.56

From table1.1, this ore contains principally of copper, quartz and aluminum oxide, copper is the valuable component and silica and aluminum are the gangue. This ore is simple chalcopyrite and is provided with few impurities of non-ferrous metal.

Table 1.2 Phase analysis of copper

copper mineral	Conjunction Cu	Free Cu	chalcopyrite	Total Cu
Content/%	0.02	0.04	0.64	0.7
Percentage/%	2.87	5.71	91.42	100

From table1.2, the main form of copper is chalcopyrite; the contents of conjunction Cu and free Cu are very low. The percentage of chalcopyrite is 91.42%. We can think that chalcopyrite is the total copper.

Table 1.3 X-ray diffraction analysis

mineral	formula	Content
chalcopyrite	$CuFeS_2$	8.43
quartz	SiO_2	32.86
kaolin	$Al_2Si_2O_5$	15.23
ankerite	$CaMg(CO_3)_2$	4.56
other		20.23

X-ray diffraction analysis is shown in table1.3. The types of minerals are simple; the chalcopyrite is the available metal mineral. The main non-metallic minerals are quartz, kaolin and ankerite.

Flotation Separations

The circuit of flotation is shown in Fig 1.

Grinding fineness. Water glass as dispersant 400 g/t and xanthate as collector 170g/t, the circuit of flotation is shown in Fig 1, the grinding fineness was researched and the effect of grinding fineness is shown in table 2.1.

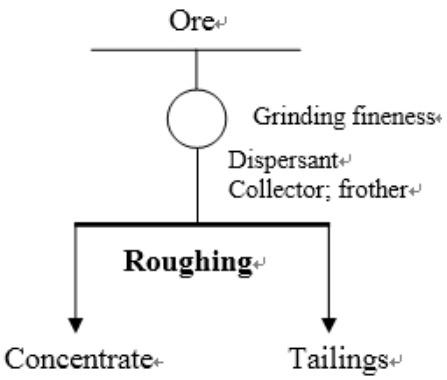

Figure 1. The circuit of flotation

Table 2.1 the effect of grinding fineness

-200	heading	Weight /g	Yield/%	grade/%	recovery/%
60%	concentrate	38.1	7.65	8.82	83.72
	tailings	460.2	92.35	0.142	16.28
80%	concentrate	39.8	8.01	8.23	89.74
	tailings	456.8	91.99	0.082	10.26
90%	concentrate	31.7	6.31	10.64	90.86
	tailings	471	93.69	0.072	9.14
95%	concentrate	39.2	7.9	8.71	92.57
	tailings	456.8	92.1	0.06	7.47

From table 2.1, the optimal grinding fineness is 90%.

The dosage of dispersant. The grinding fineness as 90%, water glass as dispersant and xanthate as collector 170g/t, the circuit of flotation is shown in Fig 1, the dosage of water glass was researched and the effect of the dosage of water glass is shown in table 2.2.

From the table 2.2, the optimal dosage of water glass is 400g/t.

The dosage of collector. The grinding fineness as 90%, water glass as dispersant 400 g/t and xanthate as collector, the circuit of flotation is shown in Fig 1, the dosage of xanthate was researched and the effect of the dosage of xanthate is shown in table 2.3.

Table 2.2 the effect of the dosage of water glass

water glass g/t	heading	Weight /g	Yield /%	Grade /%	Recovery /%
0	concentrate	34	6.85	9.82	92.56
	tailings	462.5	93.15	0.058	7.44
400	concentrate	31	6.23	10.26	95.51
	tailings	466.9	93.77	0.032	4.49
700	concentrate	34	6.83	10.39	9.56
	tailings	464	93.17	0.035	90.44
1000	concentrate	32.6	6.56	10.34	9.49
	tailings	464.2	93.44	0.039	90.51

Table 2.3 the effect of the dosage of xanthate

xanthate g/t	heading	Weight /g	Yield /%	Grade /%	Recovery /%
100	concentrate	35	7.02	9.52	92.66
	tailings	463.3	92.98	0.057	7.34
135	concentrate	38.4	7.73	9.1	92.03
	tailings	458.4	92.27	0.066	7.97
170	concentrate	31	6.23	10.26	95.51
	tailings	466.9	93.77	0.032	4.49
205	concentrate	43.8	8.84	7.82	93.85
	tailings	451.7	91.16	0.0497	6.15

From the table 2.3, the optimal dosage of xanthate is 170g/t.

Conclusion

The grinding fineness as 90%, water glass as dispersant 400 g/t and xanthate as collector 170g/t, two-stage scavenging and three-stage cleaning, at this conditions, 22.65% copper was obtained with a recovery of 89.85%.

References

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