



The Tenth International Conference on Waste Management and Technology (ICWMT)

Study of new process technology for low-grade refractory zinc oxide ore

Shang Yanbo^{a, b*}, Tan Xin^b

^a*Civil and environmental engineering school/University of Science and Technology Beijing, Beijing 100083, China*

^b*State Key Laboratory of Mineral Processing, Beijing; Department of mineral engineering/Beijing General Research Institute of Mining and Metallurgy, Beijing 102628, China*

Abstract

In this paper, a low-grade zinc oxide ore in Yunnan, China is investigated. A large number of argillaceous and alkaline gangue makes it infeasible to treat the ore with heap leaching. In order to solve this problem, several new technologies combining mineral processing and metallurgy technique are studied to process this refractory ore with 6.50 per cent Zn. It is shown that the reasonable new process technology of combining mineral processing of Zn oxides after sulfides and hydrometallurgy could realize efficient recovery of the zinc minerals in the ore. 85.90 per cent of Zn was recovered by flotation and totally 80.95 per cent of Zn can be recovered by this new technology of combining mineral processing and metallurgy. One merit of this new process technology is that the zinc sulfides and oxides can be recovered without desliming in the flotation cells at the different stage and make sure the concentrate products as a good feed for hydrometallurgical technology. This study provided pretty good technical support for tapping low-grade refractory zinc oxide ores.

© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of Tsinghua University/ Basel Convention Regional Centre for Asia and the Pacific

Keywords: Zinc Oxide, Recovery, Flotation, Low-grade;

1. Introduction

China is the biggest lead and zinc production country in the world, also the biggest consumer of the lead and zinc metals. To relieve the shortage of the metals, a large number of concentrates were imported every year. It is of great

* Corresponding author. Tel.: +086-010-59069958; fax: +086-010-59069524.

E-mail address: shang_yb@bgrimm.com.

significant to exploit the low-grade zinc oxide ores and improve the utilization ratio of the zinc natural resources. It is rich in medium and low-grade zinc oxide ores resources in China, among which, Lanping and Huize in Yunnan, Siding in Guangxi, Batang in Sichuan, Liaoning and Qinghai, etc. are the important sources [Y Wang, et al, 2010].

Up till now, the zinc grades of the ores in the exploited zinc mines are mostly more than 10 per cent; as for the low-grade zinc oxide ores with less than 10 per cent Zn, they have much difficulty in mineral processing, high mineral processing cost, low utilization ratio and serious waste of the resource, the zinc recovery is usually only 50 per cent to 60 per cent [X Duan, et al, 2000]. It has no ripe and economical metallurgical technology yet to directly treat the low-grade zinc oxide ores.

So far, it not only has few reports of research and industrialized achievements, but also has not used the technical route of combining mineral processing and metallurgy in treating the zinc oxide ores with zinc grade less than 10 per cent at abroad. In China, it results the stopover of the researches on treating the low-grade zinc oxide ores in the stage of lab or scale-up test from the relatively independent of mineral processing and metallurgical technique and the poor economic benefit of mineral processing in independently processing the low-grade zinc oxide ores.

A lead and zinc mine in Yunnan has one of super large-scale lead and zinc deposits in China. In order to develop and utilize this mineral resource, lots of experimental researches have been carried out [G Shao, et al, 2006; X Tan, et al, 2010; X Zhang, et al, 2003, 1995], and the comprehensive recovery indexes are not yet satisfactory due to its deep oxidation and complexities of ore property, mineral composition and mode of occurrence of elements. As for a large number of low-grade zinc oxide ores, they have the problems of high acid consumption (up to H₂SO₄ 450kg/t ore) and low efficiency of solid-liquid separation, etc. due to the high content of argillaceous and carbonated gangue if directly processed with wet metallurgy [X Tan, et al, 2012]; or have the problems of high throughput of metallurgy and low grade of mineral processing concentrates, etc. when processed with ammonia leaching--slag mineral processing process [Y Wang, et al, 2010]. Because of the technical problem, the deposit has not yet been exploited in large-scale. So far only the part with zinc grade more than 20 per cent has been developed, and the part with lower zinc grade, usually less than 10 per cent, cannot be processed economically (X Zhang, et al, 1995; T Zhou, 2004).

Therefore, it may not only solve the problem of the comprehensive utilization of low-grade zinc oxide ores, expand the available resources of zinc, but has good economic benefit and improve the competitive advantages of enterprise as well by breaking through the train of thought of seeking the grade and recovery of main metals in conventional mineral processing technology and finding the optimum economic bonding point of mineral processing and metallurgical technique from the angle of combining mineral processing and metallurgy.

In this paper, it is studied that the new processing technology of combining mineral processing and hydrometallurgical technique on recovering Zn from the limestone type sample of low-grade zinc oxide ores containing argillaceous and carbonated gangue. Some important parameters in processing the low-grade refractory zinc oxide ore are also introduced in this paper.

2. Methodology

2.1. Materials

The limestone sample of zinc oxide ore with 6 per cent Zn was collected from a lead and zinc mine in Yunnan, China. It was processed with jaw crusher, double-roll crusher and vibration screen into the particles totally below 2mm and is kept for use.

2.2. Study on process mineralogy of the ore

The results of chemical analysis of the major compositions of the ore are shown in Table 1.

Download English Version:

<https://daneshyari.com/en/article/4401538>

Download Persian Version:

<https://daneshyari.com/article/4401538>

[Daneshyari.com](https://daneshyari.com)