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Orthogonal test for the leaching of gallium from porcelain clay

X.L. Deng[1], Y.H. Li[1], F. Xu[1], Y.C. Yang[2]

1. Key laboratory of Resource Exploration Research of Hebei Province;Hebei University of Engineering, Handan, 056038 Handan, Hebei, China; E-mail:dengxiaoli0310@163.com

2. Hebei Jinniu Chemical Industry Co., Ltd, Cangzhou, Hebei 061000, China.

Abstract

In order to obtain gallium from porcelain clay, the orthogonal test method was used. The results show that the gallium leaching rate will increase as time is prolonged for the calcination temperature of porcelain clay. The calcination temperature has the smallest influence on the gallium leaching rate. The acid (which was a leaching solvent,) temperature had the greatest influence on the gallium leaching rate. The gallium leaching rate will increase with the temperature of the acid solvent. The acid leaching time has no significant influence on the gallium leaching rate. Based on orthogonal test design and optimization, the leaching rate of gallium can reach 61% under the leaching conditions: the ratios of liquor to solid 40mL:1g (sample mass: volume of hydrochloric); Calcination temperature 600°C and calcination time 7h; acid leaching temperate 100°C and acid leaching time 12h. The concentration of hydrochloric acid was 6mol/L.

Key words: *Porcelain clay, Gallium, Leaching, Orthogonal test*

1. Introduction

Gallium is widely used by the electronic industry and its current price is about 500 US dollars per kilogram. Gallium is an important rare elemental metal. Metal gallium or its compounds have become an important material for today's high technology. It was used widely in information, aerospace, medical, military and other industries. With the development of high technology, application fields of the rare and dispersed metals will continue to expand. Demand will be increased year by year (Xu and Yang, 2003).

Independent gallium mineral deposits have not been found anywhere in the world. Gallium usually exists in other minerals in the form of isomorphism. Gallium comes from the by-product of sulfide deposits (such as: lead-zinc deposits), aluminosilicate mineral deposits (such as: bauxite deposits, clay deposits), alunite and coal-beds (Xu *et al*., 2004; Zhao *et al*., 2009). Because the recovery of coal-associated minerals have not been of concern for a long time, associated gallium resources have been seriously wasted in coal mining. The gallium resources in aluminosilicate deposits (such as: clay) have not been recovered as associated minerals. Therefore, the study on the extraction of gallium from aluminosilicate deposits is necessary (Xu, 2002).

In recent years, gallium, as associated ore deposits

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