

煤矸石/粉煤灰中镓的提取与分离

论文标题:煤矸石/粉煤灰中镓的提取与分离

Gallium Extraction and Separation from Shale or ASH

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随着科技的发展,镓的需求量与日俱增,价格也因其紧缺而攀升,它的价格有时甚至超过黄金。我国是燃煤大国,燃煤的废弃物煤矸石/粉煤灰的利用急待解决。由于煤矸石/粉煤灰中含有少量有用的稀散元素,如镓、锗、砷、铀、镍、铂等,为了充分利用废弃的资源,变废为宝,保护环境,提高经济效益,本课题对煤矸石/粉煤灰中镓的提取、分离的可行条件进行探讨。镓的提取以煤矸石/粉煤灰为原料,浸出液用浓度为6mol/L的HCl溶液,液固体积质量比40:1,用正交实验研究灼烧温度、灼烧时间、酸浸温度、酸浸时间等多个因素对镓提取率的影响,从而得到提取金属镓的最优条件。镓的分离从固定相的选择、流动相的选择、镓的吸附洗脱效果及最大吸附量等方面探讨以柱色谱分离法分离金属镓的最优条件;研究硅胶寿命与再生回用次数;分析共存离子对金属镓分离效果的影响程度。镓的测定用三氯化钛溶液将铁(III)、铈(III)、铈(V)等还原成低价以除去干扰,用罗丹明B溶液作为显色剂,用苯-乙醚作为萃取剂,根据分光光度法用波长560nm测其吸光度。样品预处理焙烧温度比传统方法低几百度;在镓的分离上采用硅胶—PBU色谱柱体系,利用率达96%,而且固定相可反复再生使用;样品预处理及提取过程均进行了正交试验设计,由于同时研究了多个因素,提高了效率,而且使提取率达到了90%以上。通过此种方法的提取,提取率高,用料省,充分利用废弃资源,会带来很高的经济和社会效益。

With the development of science and technology, the demand of the element Gallium is increasing day by day, and its price is increasing rapidly because of its short accommodation. The price of element Gallium in international trade was higher than gold for sometimes. Our country is of burning a great deal of coal, and the problem of castoff produced in coal mining or combusting, such as coal ash or shale, is urgent to be resolved. Owing to some available rare elements such as Ga, Ge, V, U, Ni, Pt, etc, are consisted in these castoffs, the extracting and separating of these elements are recognized in some extent. In order to using the scrap resource adequately, changing the abandoned resource into the available material, protecting our environment and improving the economical benefit, the extracting and separating methods of Ga from ash or shale were discussed in this thesis. The contents in the thesis are: The extracting of Ga: Shale or ash as the sample, with the Orthogonal designation, the effects of the baking temperature and the baking time, the extracting temperature and time with acid on extracting efficiency of Ga from the samples, were studied. The result was that the optimum condition of the extract of Ga is: with 6 mol/L HCl as the lixivium, the ratio between solid and liquid is 40:1, and the baking condition is different between shale and ash. The separation of Ga: According to the separating method of columnation chromatogram, the constant phase and the moving phase selection, the adsorption and desorption effect of Ga on adsorption system, and the most adsorption quantity of Ga were discussed in this thesis, so as to educe the optimum condition of the Ga separating. The silica gel's life and its reuse cycles, and the affection of coexisting ions on Ga separation were studied in this thesis, too. Analysis of Ga: In order to eliminate the disturbing of some elements on Ga analysis such as Fe (III), Tl (III), Sb (V), TiCl3 is used to reduce them into

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