ISSN: 2641-2039
DOI: 10.33552/GJES.2021.08.000693
Global Journal of Engineering Sciences
Iris Publishers

Short Communication

Biological Processes In Urban Mines

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Received Date: September 13, 2021

Published Date: October 07, 2021

Keywords: Critical elements; Microorganisms; Urban mines; Biological processes; Recycling

Introduction

The innovation and development of high technology have demanded the exploration of some chemical elements in greater quantity. These elements have physicochemical properties of high economic interest. Some countries have larger amounts of the reserves of these elements, creating an imbalance in world supply. An example of the use of these materials are rare earth elements widely used in equipment with greater energy efficiency and magnets in wind generators. They are also present in increasingly modern computers, cell phones and televisions. Given this reality, this work proposes to recover critical elements from alternative sources (electronic waste - REE) using a biological process as a tool for solubilization of waste elements with subsequent recovery. The proposed technique is bio-hydrometallurgy, already used to obtain elements from mineral deposits where the solubilization of elements by microorganisms occurs. These are capable, due to their small size (on a micrometric scale), of reaching cracks and providing elements in solution even if they are combined with other elements in the structure, facilitating recovery. This tool is being studied by the Mineral Processing Laboratory of the Federal University of Rio Grande do Sul as a complement and aims to explore and reuse elements that are combined not by natural processes but by human-industrial processes in the form of urban mining. The material used in the recovery methodology are printed circuit boards (PCB) from computers, cell phones, lamps, among other electronic devices. Among the elements of greatest interest are the lanthanides (15 elements), yttrium, scandium, gallium and indium, all considered critical elements. These wastes are considered urban mines, with complex structures for recycling and that often make recovery unfeasible, however, the concentration of these residues and the consolidation of a technique that facilitates recovery are of great interest. The methodology consists of dismantling, classifying and characterizing these equipment's and subsequently using the biological process under different conditions of temperature, agitation, pH and nutrients, accelerating the interaction and solubilization of the elements. One of the microorganisms to be used is the bacterium Acidithiobacillus ferrooxidans, with properties already known for extracting elements from mineral deposits. The experiments are conducted and monitored by techniques/equipment such as atomic absorption (AA), scanning electron microscopy (SEM), X-ray fluorescence (FRX). Some initial results obtained from some electronic equipment showed the recovery of indium, gallium in initial experimental conditions with specific culture medium for A. ferrooxidans. In view of the encouraging initial results, the progress of the work follows.

Acknowledgement

None.

Conflict of Interest

No conflict of interest.

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