World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:17, No:10, 2023

Correlation Between Ore Mineralogy and the Dissolution Behavior of K-Feldspar

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Abstract : Feldspar minerals are one of the main components of the earth's crust. They are tectosilicate, meaning that they mainly contain aluminum and silicon. Besides aluminum and silicon, they contain either potassium, sodium, or calcium. Accordingly, feldspar minerals are categorized into three main groups: K-feldspar, Na-feldspar, and Ca-feldspar. In recent years, the trend to use K-feldspar has grown tremendously, considering its potential to produce potash and alumina. However, the feldspar minerals, in general, are difficult to decompose for the dissolution of their metallic components. Several methods, including intensive milling, leaching under elevated pressure and temperature, thermal pretreatment, and the use of corrosive leaching reagents, have been proposed to improve its low dissolving efficiency. In this study, as part of the POTASSIAL EU project, to overcome the low dissolution efficiency of the K-feldspar components, mechanical activation using intensive milling followed by leaching using hydrochloric acid (HCl) was practiced. Grinding operational parameters, namely time, rotational speed, and ball-to-sample weight ratio, were studied using the Taguchi optimization method. Then, the mineralogy of the grinded samples was analyzed using a scanning electron microscope (SEM) equipped with automated quantitative mineralogy. After grinding, the prepared samples were subjected to HCl leaching. In the end, the dissolution efficiency of the main elements and impurities of different samples were correlated to the mineralogical characterization results. K-feldspar component dissolution is correlated with ore mineralogy, which provides insight into how to best optimize leaching conditions for selective dissolution. Further, it will have an effect on purifying steps taken afterward and the final value recovery procedures

Keywords : K-feldspar, grinding, automated mineralogy, impurity, leaching
Conference Title : ICHCP 2023 : International Conference on Hydrometallurgy and Chemical Processing
Conference Location : Istanbul, Türkiye
Conference Dates : October 16-17, 2023