

Thermodynamic evaluation of the aqueous stability of rare earth elements in sulfuric acid leaching of monazite through pourbaix diagram

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ABSTRACT

The objective of this study is to construct Pourbaix diagram (Eh-pH diagram) for Lanthanum (La), Cerium (Ce) and Neodymium (Nd) elements at elevated temperatures. The Pourbaix diagram is able to map the stability area of the aqueous system, which will be useful to determine the process conditions that favor dissolution and possible rare earth (RE) metals that may be present in the system. In this work the process condition is based on the sulfuric acid leaching of monazite concentrate and it is carried out using HSC Chemistry 8.0 software. Addition of the sulfate ions from the sulfuric acid as the leaching solvent, introduces soluble metal-sulfate complexes. With temperature increase, the stability of these complexes increases. This can be observed based on the increased area in the Eh-pH diagram. Comparing the 3 rare earth elements in this study, it was determined that at elevated temperatures the order of stability is Ce>Nd>La.

KEYWORDS

Aqueous stability; Monazite; Pourbaix diagram; Sulfuric acid leaching

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