

The evolution of mineral processing in extraction of rare earth elements using solid-liquid extraction over liquid-liquid extraction: A review

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ABSTRACT

This review paper summarises the fundamental in the production of rare earth elements (REE) specifically on the extraction of REE. Liquid-liquid extraction (LLE) is known to be the most common method employed in the extraction of REE. However, it possesses a few disadvantages by having poor contact area and the formation of third phase during the extraction process. Solid-liquid extraction (SLE) compensates most of the disadvantages in LLE such as the formation of third phase and poor contact between extractant and desired elements. The focus of this paper is to review the evolution of REE extraction and discovers the potential of REE extraction through SLE. Extractants are available widely but when assisted by supporting material via immobilisation, theoretically it elevates the contact area between extractant and desired REE and this concept is known as extractant immobilised material (EIM). The graphical abstract illustrates the concept of EIM between extractant immobilised supporting materials which increases the potential of REE being extracted from aqueous phase. The material is not limited to polymeric resin, silica and membrane, but also microorganism, bio-derived and hybrid materials. EIM is expected to enhance the contact surface area, avoid third phase formation, and reduce the use of chemicals thus increasing the extraction and selectivity of REE. Also, EIM in SLE has the potential to surpass the conventional method in LLE in terms of quantity and quality.