

Circular hydrometallurgy approaches towards more sustainable processing of Critical Minerals

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Abstract

Circular hydrometallurgy, a concept popularised by Professors Binnemans and Jones from KUL, Belgium, is becoming a cornerstone perspective for extractive metallurgical processes, and in particular for the processing of Critical Minerals, and their associated metals and materials. This presentation will review examples in the development of novel processes for some Critical Minerals essential in the Energy Transition, such as nickel, cobalt and copper, and associated precious metals such as PGMs, gold and silver. The Energy Transition towards cleaner forms of non-fossil energy requires a complete rethink as to how we design our processes from the perspectives of energy utilisation, the use of benign reagents, the recycling and reuse of reagents and water, and valorisation of traditional waste products. Examples will be provided where amino acids have been used in hydrometallurgical pathways to extract and refine a variety of Critical Metals from their ores, tailings, concentrates and from various technospheric (i.e. human-derived) waste materials. The circularity around waste products, water and reagents reuse will be emphasised, while still ensuring economic feasibility.