

PRECIPITATION OF RARE EARTH ELEMENT SALTS OF HIGH PURITY

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ABSTRACT

Rare earth elements (REE) are essential in high performing permanent magnets used in e.g., wind turbines and motors. A rising demand coupled with a scarcity of supply makes some of the REE identified as critical raw materials in many parts of the world. There is a need to develop more sustainable and competitive processes for REE extraction from primary and secondary resources. Magnets can be recycled via different approaches including reuse, direct recycling, or indirect recycling. In indirect or chemical recycling, the end-of-life products are processed to extract the REE and to make the elements available for new uses. Developing techniques to do this in an economically and environmentally sustainable way is vital to create a raw-materials circular economy for these materials.

An important step is the precipitation of REE salts, which should be designed to obtain crystals of high quality in terms of crystal size, size distribution and purity. Antisolvent precipitation is a promising technique to obtain rare earth salts with high yield and of high quality. In this talk key aspects in the design of REE antisolvent precipitation processes for obtaining crystals of high quality will be presented. The focus will be on precipitation of mixed REE sulphates from impure leach liquors in the recycling of magnet waste. Different mechanisms for impurity incorporation will be discussed. Possibilities to control the precipitation process to avoid impurity incorporation will be presented. The findings can be directly applied to processes for recycling of magnet waste, but also to other hydrometallurgical processes where there is a need to recover REE salts of high quality.

Keywords: Rare earth elements, magnets, recycling, hydrometallurgy, precipitation, crystallization