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# Current Advances in Rare Earth Element Extraction and Recovery Via Polymer Inclusion Membrane: A Review

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## Abstract

The separation and recovery of rare-earth elements (REEs) is crucial owing to their indispensable role in the latest technologies and the rising requirement for sustainable and optimal extraction techniques. This review emphasizes the present advancements in REE separation and recovery using polymer inclusion membranes (PIMs). PIMs are widely recognized for REE extraction owing to their distinctive characteristics and benefits. This review discusses the essential aspects of PIM, including the building blocks like plasticizers, extractants, and base polymers. The discussion comprises the extraction techniques that PIMs enable, highlighting their selectivity and efficiency. Moreover, the difficulties related to PIM use for REE separation are discussed, along with likely future recommendations for improving their performance and usability in the real world by improving PIM

design, solvent applicability, and scalability to improve output and sustainability. If these concerns are addressed, PIM-specific technologies may lay the foundation for better REE recovery efficiency using secondary sources, offering better environmental sustainability and preservation. © 2025 FIMTEC & MPRL. All rights reserved.

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Base polymer; Extractant; Mechanism; Plasticiser; Polymer inclusion membranes; Rare earth elements

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