

FESE快读 从湿法冶金尾矿水中回收锰离子的成核结晶造粒过程研究

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FESE快读 从湿法冶金尾矿水中回收锰离子的成核结晶造粒过程研究。 论文标题：Study on the nucleation crystallization pelleting process for manganese ion recovery from hydrometallurgical tailings water

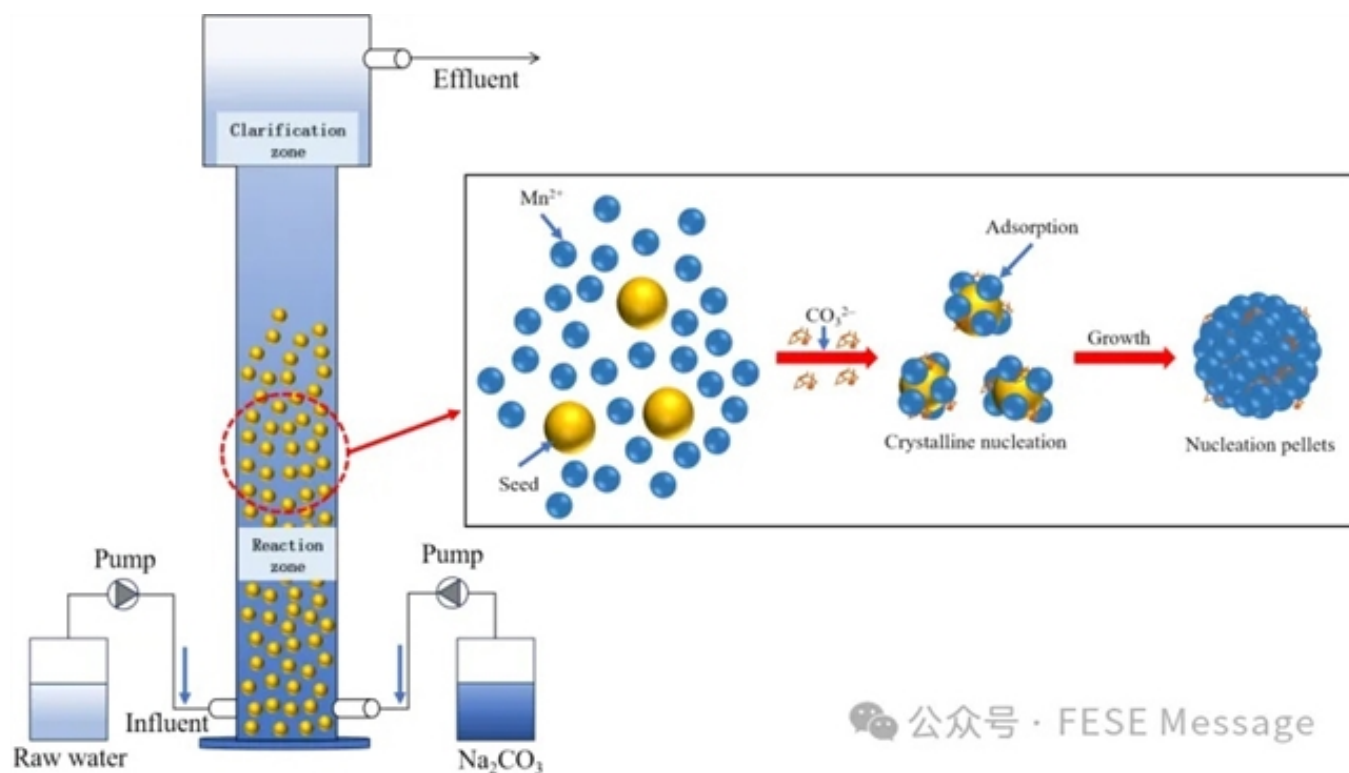
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摘要图

从湿法冶金尾矿水中回收高浓度锰离子（数万毫克每升）面临着巨大挑战，这不仅造成资源浪费，也引发了环境问题。为此，本研究提出了成核结晶造粒工艺，该技术可促使锰离子附着于专用晶种表面，形成可回收的成核颗粒。在优化条件下（晶种粒径60–80目、碳酸钠投加量2500 mg/L、进水pH 3、上升流速50 m/h），采用多级串联反应器，实现了稳定连续运行，锰离子去除率达99%以上。激光粒度分析和扫描电子显微镜结果显示，晶种逐步生长，形成疏松多孔的表面结构，增强了碳酸锰（ MnCO_3 ）颗粒的附着能力。X射线衍射、X射线光电子能谱及zeta电位分析结果表明，锰离子主要以 MnCO_3 的形式附着于晶种表面，纯度检测证实成核颗粒中 MnCO_3 含量达95%以上。本研究证明了成核结晶造粒工艺的高效性和实际适用性，强调了其在减少资源浪费和环境影响方面的潜力，为从湿法冶金尾矿水中回收高浓度锰离子提供了切实有效的解决方案。

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RESEARCH ARTICLE

Study on the nucleation crystallization pelleting process for manganese ion recovery from hydrometallurgical tailings water

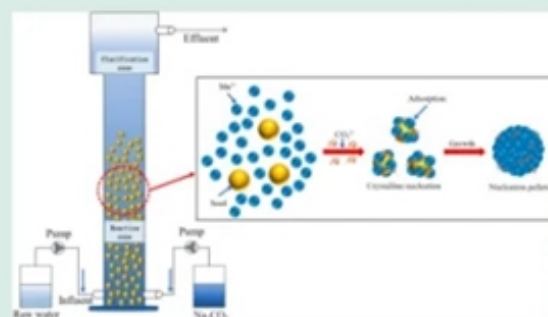
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HIGHLIGHTS

- NCP has been proposed to recover manganese from hydrometallurgical tailings water.
- Key factors influencing manganese carbonate recovery have been identified.
- The multi-stage NCP has been developed to recover manganese.
- The performance of the process in manganese recovery has been evaluated.



ABSTRACT: The recovery of high-concentrations manganese (Mn) ion (tens of thousands of milligrams per liter) from hydrometallurgical tailing water poses considerable challenges, leading to resource wastage and environmental concerns. To address this, this study proposes the nucleation crystallization pelleting process, a technique that facilitates the adherence of Mn ion onto the surface of specialized seeds, enabling the formation of nucleation pellets for recovery. A multistage series reactor was used under optimized conditions (particle sizes of 60–80 mesh, sodium carbonate dosage of 2500 mg/L, influent pH of 3, and upflow velocity of 50 m/h). A stable and continuous operation of the reactor resulted in a Mn ion removal rate of > 99%. Laser particle size analysis and scanning electron microscopy results revealed that seeds growth occurred progressively, forming a loose and porous surface structure that enhanced the attachment of manganese carbonate (MnCO_3) particles. X-ray diffraction, X-ray photoelectron spectroscopy and zeta potential analyses results demonstrated that Mn ion predominantly adhered to seed surface in the form of MnCO_3 with purity detection confirming nucleation pellets achieving a content of > 95%. This study demonstrates the high efficiency and practical applicability of this nucleation crystallization pelleting process and highlights its potential to significantly reduce resource wastage and environmental impacts, offering a practical and effective solution for recovering high-concentrated Mn ion from hydrometallurgical tailing water.

KEYWORDS: Nucleation crystallization pelleting process, Hydrometallurgical tailings water, Manganese recovery, Manganiferous wastewater

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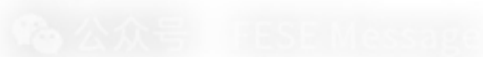
本文内容来自FESE期刊2025年第19卷第7期发表的研究文章Study on the nucleation crystallization pelleting process for manganese ion recovery from hydrometallurgical tailings water。通讯作者为西安交通大学人居环境与土木工程学院金鹏康教授。

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