

NANOFILTRATION-BASED TREATMENT OF MINE WATER: LESSONS FROM GERMANY AND SOUTH AFRICA UNDER THE MAMDIWAS PROJECT

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Abstract:

Mining-influenced water (MIW), particularly acid mine drainage, presents significant environmental and economic challenges in mining and post-mining regions. The MAMDIWAS project addresses these issues through the application of innovative treatment technologies, with a strong focus on nanofiltration (NF) membranes as an efficient solution for water purification and resource recovery. This study primarily focuses on case studies in South Africa, where MIW is a critical concern, while also exploring the transferability of the developed approaches to other contexts, particularly Ghana. Nanofiltration offers a selective and energy-efficient method for removing dissolved contaminants such as heavy metals and sulfates, while enabling water reuse. Within MAMDIWAS, NF membrane systems are developed and optimized to enhance performance under challenging MIW conditions. Key aspects include mitigating membrane fouling and scaling, as well as designing suitable pre-treatment strategies to improve long-term operation. In addition to water treatment, the project investigates the potential for recovering valuable materials from MIW streams, contributing to circular economy principles. The technological work is embedded within a broader framework of Integrated Water Resources Management (IWRM), including stakeholder engagement, governance considerations, and capacity building. First results demonstrate the effectiveness of NF-based systems in improving water quality and enabling resource recovery. At the same time, similarities in mining-related challenges highlight strong potential for transferring these solutions to countries such as Ghana. Overall, MAMDIWAS provides a scalable and adaptable framework for sustainable MIW management across different regional contexts.

Keywords: Mining-Influenced Water, Nanofiltration Membranes, Resource Recovery.

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