**Circularity in Mining: Innovation Strategies for Tailings as a Resource**

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# ABSTRACT

The reuse of tailings presents significant opportunities and challenges for ensuring a circular economy within the mining industry. Iron ore is the upstream material for the steelmaking industry, and thus, enhancing circularity in mining operations can significantly contribute to achieving full circularity across the entire value chain. However, reusing mining waste, such as iron ore tailings, is fraught with complexities, technical challenges, and economic considerations. This paper examines the efforts and experiences of the research and development sector within the iron ore and steel industry, focusing on the establishment of circular solutions at mining sites across various continents.

The challenges of finding alternative uses for tailings include low availability of data, variability in tailings composition, difficulties in sampling, and challenges associated with remining tailings storage facilities or end of pipe streams. Additionally, identifying suitable local or regional applications and the lack of knowledge about potential applications of tailings further complicate the reuse process. Despite these challenges, the positive aspects of tailings circularity are significant. Reusing tailings can reduce liabilities and risks associated with tailings storage, as well as lower costs related to transport, pumping, dewatering, disposal, monitoring, and closure.

This paper highlights the benefits and obstacles encountered in the quest for sustainable tailings management. The findings underscore the importance of continued innovation, investment in research, and the development of robust frameworks to support the transition towards a more sustainable and circular mining industry. Forming partnerships with universities, research centres, other companies, and institutions is critical for overcoming the challenges associated with reusing iron ore tailings, as these collaborations facilitate the exchange of knowledge, innovative technologies, and resources, enabling the development of more effective and sustainable solutions. Addressing the technical and economic challenges associated with tailings reuse is crucial for paving the way for a more resilient and environmentally responsible industry, ultimately contributing to the global goals of sustainability and resource efficiency.