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Exploring critical and strategical raw materials recovery potential from mining waste: findings from some Italian historical mining districts

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The growing demand for emerging green technologies, crucial for advancing ecological sustainability and digitalization, presents new challenges to European institutions. The European Union (EU) has conducted assessments and compiled a list of critical raw materials (CRMs) and strategic raw materials (SRMs) necessary for producing these technologies. Consequently, recent policy initiatives have been developed to reduce the EU's dependence on external suppliers and promote circularity and sustainable sourcing practices, focusing on increasing internal production of SRMs and CRMs. This includes taking measures to investigate the potential for recovery of CRMs from extractive waste as a priority action (European Commission, 2023).

Significant amounts of valuable minerals were disregarded during previous mining operations and relegated to waste streams, including tailings or waste rock piles. In Italy, mining wastes are distributed in more than 500 sites within the country, according to the official National Inventory of Mining Waste Facilities (ISPRA, 2022). Moreover, this waste could also create sanitary and visual environmental impacts and contain substantial quantities of waste material that may comprehend valuable amounts of raw materials overlooked in past industrial operations.

The overall objective of this work is to implement a data-driven circular economy approach within the extractive industry, emphasizing the reuse and recovery of end-of-process materials, seeking to establish a zero-waste supply chain for raw materials and rehabilitate abandoned and polluted mining areas. A multi-step approach was designed, integrating publicly available information from governmental sources, scientific literature, and field data. Bibliographical research from modern and historic literature was conducted and data were collected to narrow down the selection of potential abandoned mining sites in Italy for detailed investigation (Baldassarre et al., 2024).

The historical mining districts of Traversella (Piedmont) and Libiola (Liguria) were selected for a detailed investigation. Sampling campaigns were realized by collecting mine waste to characterize them in terms of chemical and mineralogical composition using both on-site portable XRF analyses and laboratory analytical techniques, such as Optical Microscopy (OM), X-ray Powder Diffraction (XRPD), Scanning Electron Microscopy (SEM) and Induced Coupled-Plasma Mass Spectroscopy (ICP-MS). Based on the results obtained, some valuable minerals and elements were identified. Overall, this approach can potentially identify an alternative source of raw materials, utilizing mine waste as a potential source of SRMs and CRMs.

Baldassarre G. et al. (2024) - Recovery of Critical Raw Materials from Abandoned Mine Wastes: Some Potential Case Studies in Northwest Italy. RawMat, 2023, 77, https://doi.org/10.3390/materproc2023015077.

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