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A circular economy classification of mine waste

Circular economy is a framework for an array of critical changes in the global economy trends, aimed at reducing its pressure on the Earth's resources, on the environment and on the climate. A continuous decrease is observed in minable grades for most commodities, implying that waste rates increase in ore beneficiation. The move from underground to open pit extraction increases also massively the amount of waste rock. Waste is one of the biggest costs and burdens of mining. A systematic increase of waste recycling, reducing together the need in primary resources and the waste generation, is critical for mining future. Waste reprocessing aims at better recovery of primary commodities, recovery of overlooked or critical metals, and extracting reusable mineral fractions. Recovery and reuse do not always pay for themselves but reduce the cost of site remediation.

Mine waste has a higher sustainability potential when compared with mineral extraction, especially in energy and land use. It however often contains residual metals and undesirable or potentially toxic elements. Reuse options for residual mineral fractions include civil engineering, cement and building materials. Waste classification by hazardousness or by ore grade is not suitable for their development. A new classification is proposed for reusable mineral fractions, based on physical and chemical properties and on suitability for the main potential applications.