

Software Tool Development for Evaluating the Beneficiation Potential of Mining Waste

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The Geological Survey of Finland (GTK) is actively engaged in research projects focused on tailings management and re-mining, encompassing mineral reserve studies and beneficiation tests. These projects aim to minimize mining waste by extracting valuable resources from tailings and exploring innovative applications. The REPower-CEST project, funded by the EU's Recovery and Resilience Facility, emphasizes the transition to green energy and its demands for a wide range of critical raw materials (CRMs). To support the efficient extraction and diversification of CRM sources, as well as the reduction of mining and processing waste, a software tool is being developed at the Geological Survey of Finland. The tool conducts mining waste analysis primarily through representative automated mineralogy assessments, complemented by essential chemical and mineral analyses. Automated mineralogy data is integrated into the software via MS Access databases, compatible with various SEM-AM systems such as MLA, AMICS, and INCAMineral. Moreover, the software includes an extensive mineral database with information on beneficiation properties, application domains, and value assessments. It combines the produced datasets with an embedded mineral property database and mineral processing information to achieve a repeatable and systematic identification and visualization of the potential utilization of minerals. This comprehensive data integration enables the characterization of materials, assessment of applications and value, determination of processability, and evaluation of health and environmental risks. The software significantly accelerates sample analysis while reducing error-prone manual operations. The results can be used to produce estimates of the potential value of minerals and metals for the clean energy transition and serve as a roadmap for evaluating the potential of tailings beneficiation, aiding the preliminary selection of optimal unit processes and technologies.