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The KaiHaMe Project – Increasing Raw Material Value of Exploited Ores

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Management of mining wastes is the primary challenge of sustainable mining due to their large amounts and potential long-term generation of low quality drainage. Only a small part of excavated ores can usually be utilized and the rest of the material is disposed as a waste, i.e. as waste rocks or tailings. Disposal of wastes, especially hazardous waste, in an environmentally and geotechnically acceptable manner in long-term is costly and may often mean waste of natural resources, if only the most obvious commodities are utilized. The project "Mining waste management methods", KaiHaMe, aims at increasing raw material value of the excavated ores and decreasing the amount of disposed hazardous wastes. This is done by modifying tailings and by seeking new options for waste rock use. The focus of the project is on the extractive wastes from gold and base metal ore exploitation.

Thorough mineralogical and geochemical characterization of wastes was carried out to evaluate their utilization and raw material potential. Beneficiation tests were applied to modify the tailings from gold ore processing to decrease their arsenic and sulphide content in order to decrease the amount of hazardous waste and to increase the amount of usable waste. Filled-in lysimeters were used to assess the impact of tailings processing on the effluent quality and the use of the As-depleted tailings as a tailings cover material. In addition, field lysimeters were applied to test the weathering behaviour of the waste rocks and the applicability of the rocks in cover structures and other land use.

The project identified new solutions for increased use of waste materials. In the beneficiation tests, enhanced grinding and adjustment of chemical input, grinding materials and duration of flotation produced tailings with improved environmental properties and utilization potential. Based on the results from the filled-in lysimeters, the drainage quality from the As-depleted tailings complied with the improved properties. The waste rock lysimeter tests and characterization of the rocks suggested the Ni-bearing waste rocks can be used e.g. as a cover material for AMD producing waste rock. As a result, an operational model for the optimal use of wastes was developed to enhance material ecoefficiency. The developed procedure combines both raw material aspects and environmental properties of waste materials.

The KaiHaMe project will increase sustainability and feasibility of mining activities through enhanced use of materials and a decrease in the environmental footprint of operations. The project is funded with ERDF funding.