

# **Historical mine tailings and waste rocks as secondary sources of critical raw materials around the Mecsek Hills, Hungary**

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Securing the future supply of energy and minerals is fundamental for both regional and global economic development and prosperity. The need for critical raw materials is increasing rapidly in the EU and globally. Mining activities in general, and quarrying processes in particular, generate huge amounts of tailings with a considerable presence of fine particles and with a variable composition of minerals, which could limit the direct application of those wastes. Under the paradigm of a circular economy, more effort has to be made to find adequate applications for those secondary raw materials. The re-processing of mine tailings and waste rocks to obtain critical raw materials (CRM) could reduce the mining of new deposits as well as ensure the profitable use of the waste materials. Various existing practices and potential for turning mining waste into valuable products exist. The tailings inventory in Hungary's metal and coal mines showed that considerable concentrations of many critical metals are contained in the waste. Surveying activities were carried out at several locations in the Mecsek Hills region. Sampling of mining waste, combined with collection of statistical data on the amount of mined and processed ore, has been ongoing at Mining Property Utilization Ltd. since the end of mining operations. At this mining region in southern Hungary, tailings contain critical elements such as Be, Ge, Zr, and additional values of Ni, Cr, V, and Ga further indications of Nb, Ta, Zr, Hf and REE. The mine waste was characterized, both chemically and mineralogically. The pseudo-total elemental concentration and quantitative mineralogical composition were determined by ICP-MS and ICP-OES analysis using previous multi-acid digestion (HClHNO<sub>3</sub>-HF-HClO<sub>4</sub>), X-ray diffraction (XRD), and HR-FEG-SEM-EDX, respectively. The aim of our research is the sustainable extraction of these secondary raw materials.