

A green future from a contentious past: gold and critical metals in the historic arsenic mining district Strassegg (Styria)

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The green technology, which is needed to limit the effect of climate change, requires substantial amounts of metals such as Bi, Co, Te, Sb and W, which the EU has termed as critical. A stable supply chain of these crucial raw materials is more urgent than ever, especially in the light of the current geopolitical instabilities. For a greater independence of critical metals, the European Union needs to rethink its strategy and encourage the domestic production of these resources. The Strassegg historic Au-Ag-As mining district is located at a high mountain pass to the north of Graz (Styria). Starting in the 15th century these mines were continuously operated for several centuries, and finally ended due to a combination of a poor economic situation and the increasing attention that the harmful work practices were receiving (e.g., As-poisoning). In historic mining districts, such as Strassegg, miners would have mostly been targeting visible minerals and elements such as gold. Little to nothing was known of the ability of sulfide minerals to host significant quantities of gold and therefore was not extracted. Our whole rock chemical analyses show that the tailings piles in Strassegg still contain a significant amount of Au and critical metals, and that much of the gold is contained as a refractory component in arsenopyrite. Further, characterizations of the mine tailing via SEM, EPMA and LA-ICP-MS have shown a remarkable content of As, Sb and gold associated with different sulfide phases. The specific content of critical metals will be assigned to ore mineralization phases and the potential of hosting critical elements will be investigated.