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ReWoRK – Recycling tungsten from ore concentration residues in Brazil

Client II – International partnerships for sustainable innovation

The conventional extraction of tungsten is associated with significant environmental impact. Among other things, current production methods result in large amounts of material residues, which accumulate in large-scale and often contaminated material dumps. These often contain high concentrations of tungsten, which, however, usually remains unused. The German-Brazilian project "ReWoRK" researches technological methods for recycling materials from the waste dumps. This work aims to help conserve natural resources and reduce the environmental impact of mining.

Tungsten recovery from dump material

For a long time, it has only been possible to process tungsten ores such as scheelite using technological processes that produce a considerable amount of unused material. This has led to the accumulation and storage of immense amounts of fine-grained residues form processing material, which are often referred to as tailings. These often contain enough tungsten concentrations to be of economic and strategic importance. "ReWoRK" works on process innovations for developing resource-saving methods for tungsten recovery.

Professor Fabio Jose Pinheiro Sousa (r.) of UFRN together with project leader Sven Schulze, at a tailing in Mina Brejuí.

Today's systems frequently use processes that allow for significantly higher material yields. However, they have site-specific requirements, such as often requiring a large amount of water, which make economic operation in dry and arid regions virtually impossible. Furthermore, these methods are not necessarily suitable for processing complex input materials, for example, molybdenum compounds. Due to the lack of adapted processing technologies, older treatment processes and lower material yields are still in use at certain sites today.

The "ReWoRK" project aims to close this research gap and provide suitable technologies for extracting previously unused tungsten content. To this end, the partner network covers the entire value chain from the exploration of raw materials to mines and research facilities to product manufacturing and recycling. Brazilian and German partners are involved in the project.

Process development

The project's initial aim is to close the gap in technological research on processing dump material. The first step involves investigating dumps in Europe and Brazil and taking extensive samples. Further steps cover process development in the laboratory, producing tungsten ore concentrates with a positive profitability forecast and constructing a functional demonstration plant.

Implementation in multiple locations

The project results are to be implemented in Brazil (Currais Novos), but also in other potential locations. For this purpose, the processing technologies for producing tungsten ore concentrate will be installed directly at the mine sites. In Brazil, there are also plans to modernize the technology currently in use, based on the project results. Meanwhile, in Germany, there are plans to adjust the techniques used to process the obtained concentrates, where necessary. In the long term, the processing technologies that are developed within the scope of this project could also play an important role in increasing the efficiency of future tungsten mines at other sites.

Increasing resource efficiency

Using secondary materials and increasing the yield in primary miningmakes it possible to increase resource efficiency, thereby conserving natural resources. Provided that additional by-products are recovered during reprocessing,

as dumps are deconstructed, newly vacant areas can be repurposed or restored to their natural state. Should there be further, possibly harmful, heavy metals in the tailings, these could also potentially be removed, thus preventing future environmental contamination. Using tailings for tungsten extraction will significantly reduce the environmental impact of mining, since the material has already been extracted and is thus easily accessible, eliminating the need for elaborate mining processes. The project also expects to reduce the environmental impact of tungsten production by increasing the efficiency of primary mining. From a strategic point of view, broadening the available technologies and input materials for tungsten production will serve to improve Germany's security of supply.

Sampling of tailings (fine fraction) for the preliminary investigations by Eng. L. Gomes Garcia (EEMA) (r.) and Professor Sousa (UFRN), Mina Brejuí 2018

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