THE RECOVERY OF SCARCE CRITICAL METALS IN ENVIRONMENTAL TREATMENTS OF MINING RESIDUES: RHENIUM IN PANASQUEIRA TUNGSTEN MINE TAILINGS

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Tungsten displays unique physical-plus-chemical properties turning it a metal of high strategic importance and a critical commodity for the EU. The mining of this metal at Panasqueira (Beira-Baixa) rendered Portugal the main European producer in the last century and the long mining history of more than a century has given rise to a huge tonnage of debris attaining 0.3% WO_3. Considering Horizon 2020 objectives and EU recent efforts to implement a sustainable retrieval of critical mineral resources, it becomes mandatory to improve the recovery of tungsten from those mine tailings and, simultaneously, to identify mineral phases carrying other valuable metals – namely rhenium, an element with scarce specific minerals [1], occurring there at a level ten times its mean concentration in the Earth's crust [2].

Rhenium is a singular metallic element with high melting point, high density, high modulus of elasticity and resistance to creep, high electrical resistivity, low friction and no ductile-to-brittle transition, configuring also a critical commodity in view of these unique properties. The availability of rhenium in residues of the old São Domingos mine – exploiting an Iberian Pyrite Belt (IPB) massive sulphide ore deposit in southern Portugal – was successfully addressed in a recent study [3].

The association W-Re was extensively focused in studies on WO_3 powders for electrochromic and catalytic applications and on $(1\text{-}x)WO_{3\text{-}y}.xReO_2$ synthetic combinations [4-6], being therefore appropriate to look for the presence of similar phases in the tailings of Panasqueira mine by combining a phase characterization through X-ray diffraction with an X-ray absorption spectroscopy (XAS) study at W L_1- and L_3-edges using synchrotron radiation. The results of a preliminary experiment [7] carried out at the ESRF using the instrumental set-up of beam-line BM-25A (SpLine) – with high-resolution powder diffraction (HRPD) and XAS facilities – and the aims of a forthcoming experiment are described, along with brief comments on the delineation of a possible strategy towards the sustainable recovery of rhenium.

References:

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