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Concentration and distribution of rare metals in tailings from the Golpejas mine (Spain)

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The Golpejas rare metal granite has been considered one of the main producers of Sn and Ta-Nb concentrates during the second half of the 20th century in Spain. Mineralization consists of cassiterite and columbo-tantalite disseminated in an albitic leucogranite, with average grades of 947 ppm Sn and 99 ppm Ta in the northern pit [1]. However, due to the inefficient processing, significant amounts of these metals were deposited in tailings, which were abandoned after the mine closure.

In this contribution, a chemical and granulometric characterization of the tailings accumulated in the main ponds (namely B1 and B2) and dumps (E4 dump) has been performed to determine their mining potential. Their mineralogy consists of variable amounts of quartz, feldspar, muscovite and clays (mainly kaolinite and montmorillonite) with accessory apatite and Fe oxides. The disposal of wastes is arranged in alternating layers of sands and clays, ranging from cm to dm in thickness. 2.9 Mt of total resources have been estimated, with average grades of 370.38 ppm Sn, 62.25 ppm Nb, 54.38 ppm Ta and 48.19 ppm REE+Y. Tailings from B1 pond show the best grades and D_{80} average grain size of 233 µm, while those from B2 pond show slightly lower grades and grain size (D_{80} of 160 µm in average). In both cases, the areas with the highest Ta, Nb and Sn contents fit with those with the largest grain size, while REE+Y seem to be concentrated in areas with smaller grain size. Finally, E4 dumps show a significantly larger grain size (average D_{80} of 491 µm), but very low Sn and REE+Y grades, although similar Nb and Ta contents to the B2 tailings.

Although metal grades are lower than those of the primary deposit, the need for critical metals to supply the European countries and to reduce dependance on imports makes their recovery from tailings a sustainable and cost-effective approach.

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[1] ADARO (1977): Primera fase de investigación en los Grupos Mineros de Golpejas y Fregeneda (Salamanca). 164 p.