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Rare-Element mineralization in the Sn-Ta Penouta ore deposit, NW Spain

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Resúmen

The Penouta Sn-Ta deposit, located in Galicia, northeast of Spain, is a greisenized granitic cupula where Ta occurs as disseminations in a leucogranite stock intruded in Precambrian-Lower Cambian gneisses and mica-schists of the Viana do Bolo series. These rocks are overlain by gneisses of the Ollo de Sapo formation. The Penouta leucogranite is a medium to fine grained inequigranular rock constituted by quartz, kfeldspar, albite and muscovite. Quartz has “snowball” texture with euhedral poikilitic crystals of about 1 mm in diameter. Accessory minerals are mainly biotite, spessartite, zircon, cassiterite, Nb-Ta oxides, monacite, xenotime, native bismuth and pyrite. The leucogranite has undergone two alteration processes with albitization, muscovitization and kaolinitization. Bulk-rock major and trace element composition was determined. These leucogranites are peraluminous and P-poor, with 0.03-0.07 wt.% P2O5. The rare element content is high, with 900-1500 ppm Rb, 30-65 ppm Cs, 120-533 ppm Li, 80-226 ppm Ta, 45-124 ppm Nb and up to 1350 ppm of Sn. Columbite-group minerals are the most common Ta-bearing phases, but microlite, wodginite or ixiolite and Ta-rich cassiterite also occur. Columbite-group minerals are mainly manganotantalite and manganocolumbite with average size of 80µm. Crystals often are concentrically zoned, with a Nb-rich core surrounded by a Ta-rich rim, with sharply boundary between them. In other cases these minerals exhibit a convoluted zoning or are homogeneous. Many of the columbite-group crystal exhibit dissolution textures that affect to columbite and especially to the tantalite rims. The Mn/(Mn+Fe) ratio is 0.33-0.97 and the Ta/(Ta+Nb) ratio is 0.07-0.93. These values are typical of highly evolved systems. Microprobe analyses reveal variable contents of Sn, and W, being the highest contents in tantalite. Wodginite, or ixiolite, has between 6 and 27 wt.% of SnO2 and up to 65 wt.% of Ta2O5 The Mn/(Mn+Fe) ratio is 0.60-0.91. Microlite is formed as a late replacement of columbite-group minerals and occurs associated with tantalite and cassiterite, usually in rounded grains of less than 60 µm in diameter. Wodgnite, or ixiolite, is formed replacing tantalite or cassiterite. Usually it is Ca-rich, but uranmicrolite and plumbomicrolite also exist. Cassiterite occurs as black, subhedral to anhedral, homogeneous crystals usually between 50 and 200 µm in size. At least two generations of cassiterite are recognized, the earlier generation is Nb, Ta-poor but in the late generation Ta content can reach up to more than 9 wt.% of Ta2O5 and 1.7 wt.% Nb, being the Ta Ta/(Ta+Nb) ratio from 0.60 to 0.91. Several stages of crystallization of Nb-Ta minerals can be differentiated; the first stage was columbite-rich and a late stage is responsible of the tantalite rim around columbite and of the replacement of columbite crystals by tantalite. Microlite and wodginite, or ixiolite, formed during the late stage.

Palabras clave

Tantalum, Rare-metal, Granite, Nb-ta Oxide Minerals

Grupo de investigación

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