

THE IMPACT OF OLD MINE WORKINGS ON THE ENVIRONMENT AT SEGURA, CENTRAL PORTUGAL

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At Segura, a Hercynian two-mica granite, muscovite granite, granodiorite porphyry and Li-bearing granitic aplite-pegmatite veins containing cassiterite and lepidolite intrude the Cambrian schist-metagraywacke complex. Aplite veins intrude this complex and granites, whereas quartz veins with cassiterite and wolframite intersect the schist-metagraywacke complex. Quartz veins with barite, galena and sphalerite intersect this complex and the muscovite granite. The area was exploited for Sn, W, Ba and Pb. Cassiterite from pegmatite and quartz veins show sequences of alternating parallel darker and lighter zones. The darker zones are pleochroic, but those of cassiterite from pegmatite have more Nb and Ta, whereas those of cassiterite from quartz veins have more Ti than the respective lighter zones, which are mainly pure SnO₂. Darker zones of cassiterite from pegmatite show exsolved manganocolumbite and mangano-ferrocolumbite. Wolframite has a higher ferberite content than heubnerite content. In single zoned crystals, Mn, Mn/Fe increase and Fe decreases from rim to core. The quartz veins with cassiterite and wolframite present the largest number of sulphides, such as monoclinic pyrrhotite, arsenopyrite, pyrite, sphalerite, chalcopyrite and stannite and also the sulphosalts matildite and schapbachite. Arsenopyrite is locally altered to pharmacosiderite. The quartz veins with barite, galena and sphalerite also contain cobaltite, pyrite and chalcopyrite, but galena is altered to anglesite, mimetite and kintoreite.

In soils and stream sediments, anomalies of Sn, W, B, As and Cu are related to quartz veins with cassiterite and wolframite, whereas anomalies of Ba, Pb and Zn are related to quartz veins with barite, galena and sphalerite. The contaminations of soils in As, Sn, B and Ba show that they cannot be used for agriculture and residences, but the contamination in As also indicates that they must not be used for commerce and industry. The spring and stream waters are contaminated in As, Fe, Mn and Zn mainly due to the old mine workings. They are not drinkable, but may be used for agriculture. The quartz veins with cassiterite and wolframite produce the highest contamination in waters, which is in As.

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