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Geochemistry of Minerals from Granitic Rocks
and Associated Quartz Veins from Segura,
Central Portugal

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At Segura, Hercynian two-mica granite, muscovite granite, granodiorite porphyry veins 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 two-mica granite contains Fe²⁺-biotite, while the granodiorite porphyry veins have Mg-biotite, but they are not related. All granitic rocks contain primary muscovite, but muscovite granite and aplite veins also have some hydrothermal muscovite. Primary muscovites show trends of fractionation for major elements from two-mica granite to granitic pegmatite. There are also increases in P₂O₅ contents of K-feldspar and albite and decrease in anorthite content of albite from this sequence. Primary muscovites from muscovite granite and aplite have similar compositions. Aplite is probably related to muscovite granite, which is formed by partial fusion of metasedimentary materials. Generally K-feldspar has higher P₂O₅ content than coexisting plagioclase, but there is no significant fractionation of phosphorus between them. In pegmatite, lepidolite is richer in Si, F, Rb and poorer in Al than muscovite that partially replaces. Primary topaz, montebbrasite and natromontebbrasite also occur in the pegmatite.

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Hydrothermal muscovite from quartz veins has more Mg and Mg/(Mg+Fe) and less Alvi, Aliv+Alvi and paragonite content than primary muscovites from the granitic rocks. Cassiterites from pegmatite and quartz veins show sequences of alternating parallel darker and lighter zones. In pegmatite, the darker zones of cassiterite have Mn >>Fe and more Nb and Ta than the lighter zones, while in quartz veins the darker zones show Fe>>Mn and more Ti than the lighter zones, which are mainly pure SnO₂. The darker zones of cassiterite from quartz veins are richer in Ti and poorer in Nb, Ta, W, Mn and (Ta+Nb)/(Fe+Mn) than those of cassiterite from pegmatite, which show exsolved manganocolumbite and mangano-ferrocolumbite. Wolframite has Fe>>Mn, and in single zoned crystals Mn, Mn/Fe increase and Fe decreases from rim to core.

The quartz veins with cassiterite and wolframite have monoclinic pyrrhotite, arsenopyrite (locally altered to pharmacosiderite), pyrite, sphalerite, chalcopyrite, stannite, matildite and schapbachite. The quartz veins with barite, galena and sphalerite correspond to a later generation and also contain cobaltite, pyrite and chalcopyrite, but galena is altered to anglesite, mimetite and kintoreite.

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