

Quantitative Mineralogy of the Beauvoir Granite and Rare-Metal-Bearing Minerals Characterization

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The albite-lepidolite-topaz granite of Beauvoir is the last intrusion in a peraluminous granitic complex of Variscan age composed of three successively emplaced units: the hidden granite of La Bosse, the two-micas granite of Colettes, and the Beauvoir granite consisting of three units, B1 to B3. Compared to similar Li-F-rich igneous bodies, the Beauvoir granite is highly enriched in Sn (200-1,400 ppm), Ta (20-400 ppm), and Be (20-300 ppm). The B1 unit is composed of albite and abundant lepidolite laths forming a framework filled with globular quartz and rare crystals of K-feldspar. This work presents a quantitative mineralogical study of the Beauvoir granite (B1 unit) and detailed textural and chemical characterization of the oxides and Li-bearing minerals (i.e., mainly lepidolite and, to a lesser degree, the Li-rich phosphates) from the cores from the PER and EMILI drilling campaigns. The first approach of this work consisted of estimating the proportion of minerals, and thus determining their abundance by comparing estimates from in situ thin section mapping from micro-XRF and the calculation of mineral phase proportion from whole-rock geochemistry on drill cores. The main trend is a "mix," for the fresh rocks, between an albite pole (~35%), and a quartz (~25%)-lepidolite (~15-25%) pole. Lepidolite textural study showed a core-to-rim zoning (Rb, Cs), while lithium contents are rather homogeneous between the core and the rim with an average of 28,000 ppm. Amblygonite and montebrasite show high lithium contents (up to 46,000 ppm in montebrasite) but are very heterogeneous at the crystal scale. Oxide minerals include cassiterite, columbite-tantalite, and microlite, particularly abundant in the upper part of the B1 unit. The results obtained, combined with drilling data, will lead to a mineralogical model block of the Beauvoir quarry and better understanding of the magmatic-hydrothermal evolution of the deposit.