Graphite inclusions in tardimagmatic fluorapatite (P-rich S-type Belvís granite, Spain)

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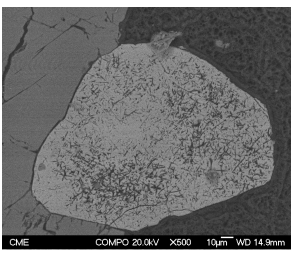
The Variscan orogen generated large amounts of felsic magmas in the Central Iberian Zone (CIZ). A large batholith outcrops in the southern part of the CIZ (the Montes de Toledo batholith), mostly of peraluminous S-type affinity [1]. The Belvís pluton stands out as the P-richest highly fractionated leucogranite within that batholith. This is a reversely zoned intrusion composed of four granite units. The two most fractionated units show a complex association of accesory minerals, among which phosphates are the most abundants. At least two generation of fluorapatites have been identified according to textural and compositional features: type-1 appears as clean small equant euhedral crystals included in quarzt, K-feldspar or plagioclase; type-2 are large (up to 2800 μm) subhedral to anhedral crystals, interstitial to the main granite minerals. Type-2 exhibits dark irregular areas in which the SEM images reveals a heterogenous concentration of microinclusions of plate graphite, (up to 15 μm x 1 μm), randomly orientated (Fig.1). This apatite type shows significant contents of Fe, Al, Si, Na, Sr, HFSE, and is Cl-richer than the more stoichiometric type-1. Therefore, type-2 apatite would crystallize from a more fractionated melt. Low-grade metasediments are considered a suitable protolith for these granites [1]. Graphite in granite melts is usually interpreted as restitic or related to carbonic fluids. We suggest the alternative of C precipitation from a P-F-rich granitic melt to originate this in close apatite-graphite magmatic intergrowth. Further carbon isotopic and Raman studies are required to address the problem of the origin of these graphite inclusions.



[1] Villaseca, Pérez-Soba, Merino, Orejana, López-García & Billstrom (2008), *Journal of geoscience* **53**, 263-280.