# Preliminary study of intragranitic pegmatites in the Sn-W-(Au) district of Navasfrías (SW Salamanca, Spain)

**T. LLORENS[1] & M. C. MORO[1]**

[1]Departamento de Geología, Universidad de Salamanca, 37008-Salamanca, Spain. tllg@usal.es, cmoro@usal.es

**ABSTRACT**

*The Navasfrías mining district has been studied for years to prospect quartz veins with Sn-W-(Au) and pegmatite dykes with Sn, that are located in the north part of Jálama pluton. Two of those mineralized areas are Horia and Mari Carmen mines, where pegmatite bodies, that are intragranitic (equigranular two-mica granite) and barren, show a slight internal zonation and have an approximate direction of NS. The preliminary study of their textural and mineralogical characteristics has allowed classifying them as type 1 pegmatites.*

***Keywords:*** *granite, pegmatites, tin, Navasfrías, Salamanca.*

## INTRODUCTION AND GEOLOGICAL SETTING

The Navasfrías mining district is located in the south-western part of Salamanca and includes a group of mining works consisting of quartz veins with Sn-W-(Au) (Moro et al., 2000) and pegmatite dykes with Sn, that were relatively important during decades.

Geologically, it is situated in the domain of Vertical Folds of the CIZ (Díez Balda et al., 1990) in the Hesperic Massif. In this context there are infraordovicic sediments with low grade metamorphism (Green Schists Facies) that belong to the Schist-Graywacke Complex (CEG), in which the so-called Jálama Pluton intrudes (Ramírez and Grundvig, 2000). This granite is an allochthonous peraluminous intrusion emplaced after the main hercinian deformational phases (D1 and D2) and formed by several facies. The most external unit of this pluton is defined by porphyritic two-mica granite, equigranular two-mica granite and tourmaline leucogranite as the border facies, with associated aplites and pegmatites (Figure 1).

## THE PEGMATITES

In the north part of this pluton there have been made several mining investigation works to prospect Sn and W, such as those carried out by IGME (1976), ENADIMSA (1982) and JCyL (1987). These works showed the presence of numerous mineralized areas, two of which are Horia and Mari Carmen mines in the northwestern zone of the granite (Figure 1). The main aim of this paper is the preliminary study of the intragranitic pegmatites found here, intruded in the equigranular two-mica granite and cut by mineralized quartz veins.

The most important pegmatite bodies of the Navasfrías district are located in the "Cruz del Rayo" area, at the north of the pluton into the CEG (Figure 1), and have an approximated direction of NS/subvertical. They appear as lenticular dykes until hundreds of m length and centimetric or metric thick with an important Sn mineralization, reaching to 600 ppm (ENADIMSA, 1982). Other shorter and narrow dykes are associated to the Jálama border facies and have the same direction but no mineralization. This is the case of Horia and Mari Carmen mines that are studied in this work.

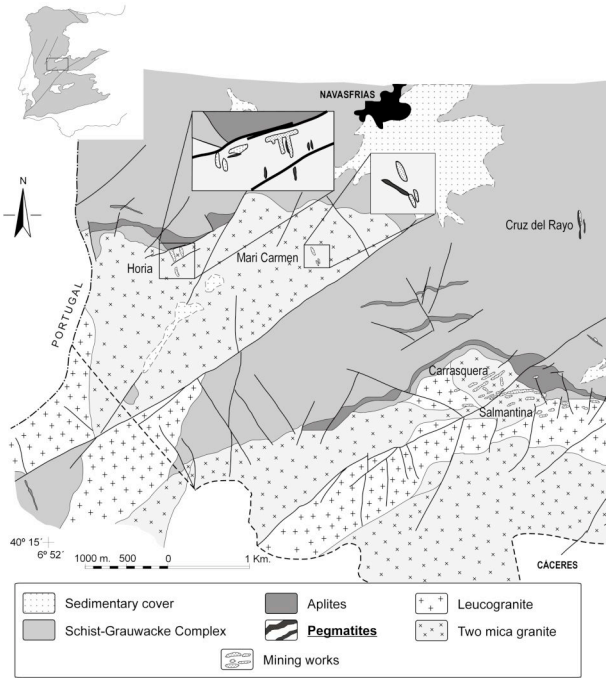


**FIGURE 1.** Geological scheme of the studied area and distribution of pegmatites.

The orientation of pegmatite bodies in Horia mine varies between 170-180ºE, apparently subvertical and occasionally intruded by mineralized quartz veins. Other secondary directions of veins are N60ºE and N120ºE. The bodies have lenticular or dyke shapes, sometimes irregular and are until one hundred length and 30 cm thick. Most of these pegmatite bodies show a slight zonation outwards (Figure 2a): 1) aplitic or microgranitic border zones composed by quartz, potasic feldspar or plagioclase, muscovite, and accessory apatite, 2) intermediate zone of medium grain size (1-2 cm depending on pegmatite type) with quartz, microcline or albite and muscovite in different proportion and accessory apatite. Crystals grow perpendicular to the contact and microcline has the vertex pointing to the walls, and 3) a core formed by coarse albite or microcline and scarce quartz that use to cross the feldspars.

In Mari Carmen mine a dyke with direction N140ºE/40ºSE outcrops (Figure 2b) reaching 100 m length and 2 m thick. Here is not possible to determine

any zonation but it defines an irregular greissen type zone in its eastern border. Moreover there are fan-shaped muscovite and quartz intergrowths and scarce apatite, generally associated with little cracks in the granite contact zone.

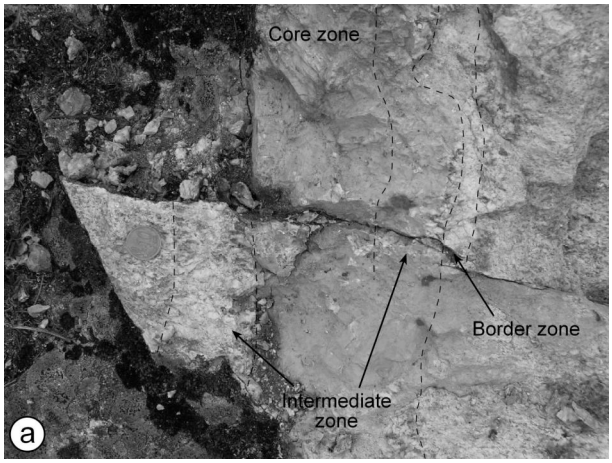



**FIGURE 2.a)** Asymmetric internal zonation in a pegmatite body of Horia mine. **b)** Outcrop of pegmatite dyke in Mari Carmen mine.

Anyway, the contact with pegmatite bodies is leucogranite, biotite has been altered and substituted by muscovite and chlorite. In other cases this dykes associate with aplites.

In addition to the three major minerals of pegmatites, quartz, feldspar and muscovite, other minerals are present in accessory amounts, such as phosphates, rutile, ilmenita, arsenopyrite, pyrite and electrum.

The most common phosphates found are apatite that appears as sub- to euhedral middle to fine-grained crystals and triplite-zwieselite series as sub- to anhedral fine-grained crystals. Both are sometimes substituted by another Ca, Fe, Mn and Al phosphates.

Rutile and ilmenite are present as prismatic or anhedral very fine-grained crystals, and are usually associated with muscovite. Moreover, disseminated fine to medium-grained sulphides have been found, generally anhedral crystals or granular aggregates of arsenopyrite and pyrite. Finally, some of these pegmatites show anhedral crystals of electrum less than 10 μm size and associated with quartz.

## CONCLUSIONS

Considering the textural and mineralogical characteristics observed from the preliminary analysis of the pegmatites and taking into account the regional zoning defined by Cerny (1992) that establishes evolved pegmatites (rich in Sn) are located far away the pluton whereas barren pegmatites appears in proximal zones or intruded into the granite, it can be concluded that pegmatitic bodies of Horia and Mari Carmen mines correspond with type 1 defined by this author, that is, barren pegmatites with granitic textures and composition.

### ACKNOWLEDGEMENTS

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