STRUCTURAL CONDITIONING AND SUMMARY OF MAIN GEOLOGICAL EVENTS IN MINERAL PEGMATITES, SERIDÓ (PB-RN)

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ABSTRACT

The Seridô region covers an abundance of mineral resources that make up the majority of industrial minerals in Brazil. Geologically, this region is composed of rocks of the Seridô Pegmatitic Province, which is located in the Rio Grande do Norte Domain of the Borborema Province. Its structure is strongly controlled by the E-W Patos Lineament and other NE-SW and N-S shear zones. This regional fabric controls extensional sites. Recent works have interpreted geological controls on the mineralization along most of pegmatitic bodies. The Pedra Lavrada and Junco do Seridô region in the Paraíba State and the vicinity of Carnauba dos Dantas in Rio Grande do Norte can be highlighted, once they concentrate several mineral occurrences explored by mining companies. On the vicinity of these towns, five similar pegmatitic bodies were mapped in a 1:2.500 scale and the mineral occurrences were recorded. They are: i) Taboa (tourmaline, garnet and rose quartz, ii) Alto do Feio (rose quartz, tourmaline, apatite and garnet), Alto do Boqueirão (tormaline and garnet), iv) Alto Serra Branca (elbaite and phosphates and v) Galo Branco (feldspars and kaolin). Apparently, most of these rocks correspond to heterogeneous pegmatites with well-defined mineral zoning from the rim to the core. However, some features suggest the evidence of homogeneous pegmatitic sites.

KEYWORDS

Pegmatites, Seridô Pegmatitic Province, NE Brazil

INTRODUCTION

The Seridô Pegmatitic Province corresponds to an important mining district in northeastern Brazil between the states of Paraiba and Rio Grande do Norte (Santos et al., 2014). This province is characterized by important mineral occurrences, including various minerals with industrial application such as mica, quartz, feldspar and kaolin, as well as extensive gemmological content which is known worldwide, such as aquamarines and elbaite tourmalines, including the famous Paraiba tourmaline of São José da Batalha region (Paraiba state).

Recent studies and detailed geological mapping have given importance to mineral zoning of pegmatite bodies in this region, especially in pegmatites that occur in the vicinity of Pedra Lavrada Town (PB). Mineralization control is usually defined in regions strongly affected by deformation or by petrology affinities with pegmatites, which are often described as heterogeneous in the international literature (London, 2008 and references therein).

The main objective of this paper is to describe some of the most important mineral occurrences in the context of Pegmatitic Seridô Province, NE Brazil, as well as the main regional structures that affect the region.
Seridó Pegmatitic Province

The Seridó Pegmatitic Province is inserted in the Seridó Belt of the Rio Grande do Norte Domain (Figure 1), which is located in the northern portion of the Borborema Province. The latter was defined by Almeida et al. (1981) as a Neoproterozoic tectonic entity that occupies the eastern portion of northeastern Brazil and was consolidated by the convergence of the São Francisco-Congo and São Luis-West Africa cratons during the Brasiliano-Pan-African orogenic cycle.

Regionally, the Rio Grande do Norte Domain consists of several sequences of orthogneiss and migmatites, which are Archean and paleoproterozoic in age, including the Jaguaribeano, Rio Pirangas and São José do Campestre domains. In addition, these rocks are intruded by several Ediacaran granites related to the Brasiliano orogenic cycle (Brito Neves et al. 2000). This area is limited by the Ceará Central areas on north and on south by the Senador Pompeu transverse shear zone and the Patos lineament.

Throughout this mining region, several occurrences of mineralized pegmatite bodies are known, including Fortuna, Mourão, Costume, Serra Branca, the Alto do Feio, among others.

The pegmatites contain well defined mineral zoning areas with sterile edges and homogeneous mineralization, disseminated in pockets in its interior. They were described by Johnston Jr (1945) as heterogeneous pegmatites.

Figure 1 - Geological map of the PPS area with the location of the main mineralized pegmatites, modified from Buerlen et al., (2014).
Main regional structures

The Seridó Pegmatitic Province is strongly affected by ductile shear zones. The most important of them corresponds to the Patos lineament, which has a regional extent and is considered by several authors as a terrane boundary (Brito Neves et al., 2000). This structure is E-W oriented and corresponds to a dextral strike-slip shear zone which strongly deforms the rocks of the Seridó Fold Belt and affects the borders of the mineralized pegmatites.

In addition, this region is also affected by NE-SW and N-S transcurrent shear zones, which can present up to 30 km extent. These are particularly important, because they are responsible by the ovoid and elongated shape of the pegmatites. Some examples of these structures include the Nova Palmeira, Pedra Lavrada and Picuí-João Câmara shear zones.

In specific regions, this ductile deformation migrates to a brittle regime, forming transtensional sites, which are usually related to the main mechanism of emplacement of mineralized pegmatites in the region as it was referred by several authors, including Santos et al. (2014 and references therein). This brittle tectonics also control the injection of mineralized veins and dykes that cross-cut pegmatitic bodies, being mostly mineralized in elbaite tourmaline, garnet and other important minerals.

Pegmatitic zoning and mineral occurrence

Well-known pegmatitic provinces can be described in terms of its heterogeneous distribution of mineralization as described by London (2008). The zonation observed in most of the pegmatites of the Seridó Pegmatitic Province can provide an insight of the mineral distribution in the region.

So far, most of studied pegmatites can be grouped in three main zones of mineral distribution. They are: i) border areas, ii) intermediate zones and iii) homogeneous core.

The edge region is also known as contact zones. It is marked by the interaction of pegmatites and host rocks. The latter is usually represented by biotite schist and garnet-biotite schist of the Seridó (Figure 2A). These rocks are strongly influenced by the aforementioned shear zones. In addition, it is pretty common in this region the presence of supracrustal in the pegmatic matrix, as an evidence of forced intrusion. This region is also characterized by extremely thick textures, which concentrate occurrences of centimetric to metric albicic feldspar, quartz and muscovite. Kaolinitic levels resulting from secondary feldspar alteration is also common, but spatially restricted (Figure 2b). Additionally, some gemologic minerals with economic importance tend to be concentrated in this region including água-marinha beryl variety (Figure 2c) and elbaite tourmaline, besides widespread garnet crystals.

The intermediate zones, which are also known as wall zones are characterized by systematic decrease of rock grain size, forming a thinner phaneritic texture. From an economic point of view, these region tend to be sterile. It concentrates mostly quartz and potassic feldspar with graphic intergrowth that is commonly interpreted as a result of chemical instability events in the last stages of fractional crystallization (Fenn, 1986).

Finally, the core areas are mainly characterized by milky quartz, occurring citrus and Murion variations. Eventually, radial muscovite crystals (Figure 2d) are frequently observed, in addition to minor black tourmaline occurrences.

However, it is important to note that some of these bodies are homogeneous or mixed with one or more pockets core of quartz or scarce in relation to the core. The understanding of the mineral distribution in this bodies is more complex and represents a further research target.
The findings of this study can be summarized as follows:

- The Seridó Pegmatitic Province hosts several mineralized pegmatites that are strongly affected by transcurrent shear zones, including the E-W Patos Lineament and the NE-SW Pedra Lavrada, Nova Palmeira and Picuí-João Câmara shear zones. Transtentional sites can be regarded as the main mechanism of pegmatitic emplacement in the region.

- Most of the heterogeneous pegmatites of the region have similar characteristic mineral zoning, as in several well-known pegmatitic districts worldwide.

- Based on the main mineral occurrences, these areas are divided into: i) border areas, ii) intermediate zones and iii) contact zones;

- The mineralogy varies from the edge to the center, concentrating a major mineral heterogeneity in the contact zones with the host rocks which includes feldspar, quartz, and gemmological minerals such as beryl and tourmaline. On the other hand, the inner regions are characterized by homogeneous patterns with varied quartz crystals. In addition, it can also contain other disseminated minerals;

- The identification of mineralized zones in the various pegmatite bodies represents a geological prospective tool that is essential for the extraction of these ore deposits.

Conclusions
REFERENCES


