SUCURI MASSIF ALBITITES FROM GOIÁS TIN PROVINCE, BRAZIL

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ABSTRACT

Albitite occurrences from Sucuri Granitic Massif, an intrusive pluton 300 Km far northeast from Brasília, Brazil, are linked with post-magmatic fluid injections controlled by later brittle shear zones. Four main granite varieties were identified in Sucuri granite, in order of importance: biotite bearing granite, fine grained granite (locally porphyritic), microgranites and fine grained granites in veins. Albitites are mainly associated to biotite bearing granite. The whole group is closely related to a petrographycally and geochemically homogeneous suites that post-dates a *ca.* 1.77 Ga Within-Plate magmatism and their intrusions are related to an anorogenic, extensional and continental environment. This magmatism and later tectonism controls the distribution of mineralized albitites from Goiás Tin Province.

Keywords: A-type Granite, Goiás Tin Province, Albitites.

INTRODUCTION

Albitites expositions are associated to the Sucuri Granite Massif (SUGM), a pluton covering an area of 8 Km^2, and belongs to Mesoproterozoic (1.77-1.58 Ga) granitoids of Goiás Tin Province in the Goiás and Tocantins States, Brazil (Fig. 1). These bodies are located in the Rio Paranã Subprovince (RPS) region, one of the four sub-provinces of paleo- to neoproterozoic ages proposed by Marini & Botelho (1986). In the RPS, A-type granite intrusions in archean/paleoproterozoic gneisses are commonly metassomatized and related with Sn-W-Be mineralizations, among other ores. They are recovered by the Groups Araí (quartzites, metassiltites and phyllites with bimodal volcanism) and Serra da Mesa, the whole representing records of a continental rift-related geodynamic environment of mesoproterozoic age (Pimentel *et al.,*1991, Pimentel & Botelho*,* 2001). According the diagram proposed by Eby (1992), Sucuri body is classed in subtype A2. The purpose of this paper is a brief discussion on geochemical and structural features constraining these occurrences.

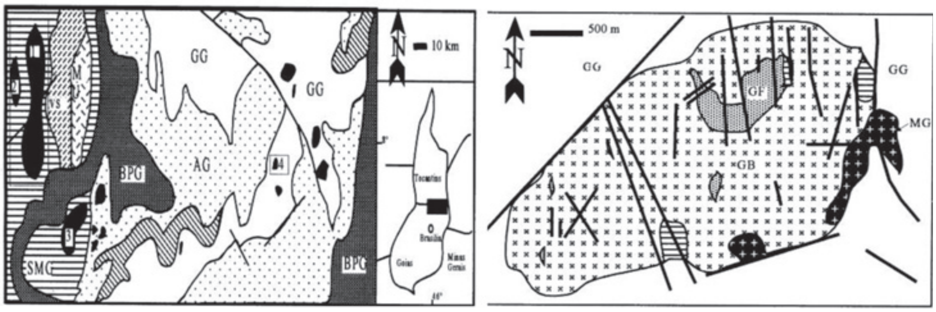
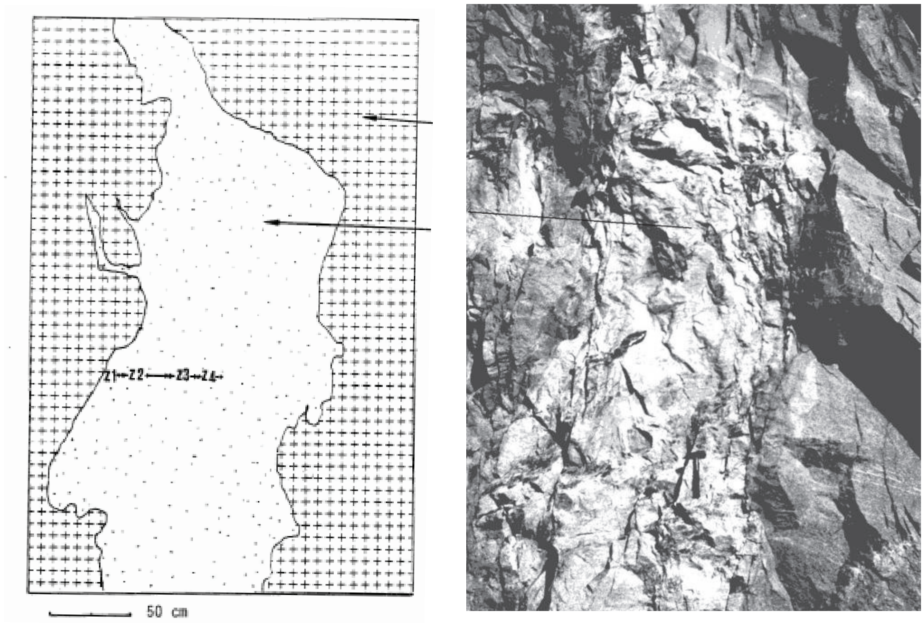


Figure 1 - Geological location (left) and sketch map (right) of albitites in Sucuri massif (modified from Bilal et al., 1997). (GG) Achean/Paleoproterozoic granitic-gnaissic country rocks; (VS) Volcano-Sedimentary Sequence; (SMG) Serra da Mesa Group; (AG) Araí Group; (BGP) Neoproterozoic Bambuí and Paranoá Groups; Granitic massifs (black area) – 1: Serra Dourada; 2: Serra do Encosto; 3: Serra da Mesa; 4: Sucuri. (BG) biotite bearing granite; (FG) fine grained granite; (MG) porphyritic granite. Horizontaly hatched area: albitized zones.

GEOLOGICAL SETTING OF SUCURI ALBITITES

In the SUGM four main facies were proposed by Bilal *et al.* (1997), dominated by a (i) biotite bearing granite (BG), (ii) minor amounts of fine grained granite (FG) locally porphyritic (FPG), (iii) microgranites (MG) and (iv) fine grained granites in veins of 2m wide maximum. Many meter-wide albitite bodies found in SUGM develops as veins and patches by the progressive transformation of country rocks. The albitisation process erases the granite texture, foliation and also the mylonitized structure of greisens (Fig. 2). Zones of albitization are linked with a NE-SW to NW-SE trends of conjugated brittle shear zones, then cutted by NNE-SSE (older) and NE-SW (younger) fractures. The FG lenses emplacement is controlled by a N150,60^{0}NW direction in GB (roughly foliated N-S,50^{0}W) and in some places varies from sub-horizontal to NW dipping 60^{0}NE. GB has an increasing porphyritic tendency to SW portion. Later NNE trends are related to the Brasiliano/Panafrican orogeny in the Brasília Belt. Greisens are mainly associated to apical regions of fine granite lenses.



Biotite granite	Albitite Zone 1	Zone 2	Zone 3	Zone 4
Biotite (I) Fe/Mg= 22.4	Biotite (II) Fe/Mg = 12	<---------- Biotite (II) --------------> <------------ Fe/Mg= 10 ----------->		
Muscovite	Muscovite >	<------------ Albite --------------->		
Plagioclase An20-16	<----------------------- Albite --------------------> <------------------------ An0.5 ------------------->			
K-Feldspar	K-Feldspar----------->	<-------- Albite ------->		
Quartz	Quartz------------------------------>			Albite
	<--------------- Helvite --------------------------> $Ge_{24}Da_{51}He_{25}$; $Ge_{30}Da_{49}He_{21}$; $Ge_{64}Da_{10}He_{26}$			
	Pyrrhotite, Chalcopyrite, Sphalerite, Pyrite, Galena and Cubanite			

Figure 2 – Mesoscopic features (right) of an albitite vein (dots), its zonation sketch (left) and table showing the order of mineral occurrences at various zones from biotite granite (crosses) to albitites in SUGM.

LITHOGEOCHEMICAL FEATURES OF SUCURI ALBITITES

Albitite samples are from Tratex quarry and Cachorros mine, respectively in the northeast and southern portions of SUGM. Our focus is on zones 1, 2 (muscovite-*out*) and 3-4 (potassic feldspar-*out*). Chemical compositions from each zone were normalized to a representative sample from BG (Fig. 3). Data (Table 1) and analytical methods are described in Bilal (1997).

Major Elements: In the first zone the anorthite portion from plagioclase vanishes, corresponding to CaO leaching. Muscovite disappearing and potassic feldspar transformation are inducing K_2O losses. MnO increase is linked to helvite formation. Na_2O increase is closely related to albite neoformation. Slight increases in MgO corresponds to the increasing Mg contents in biotite of this zone. Zone 2 is recognized by a complete transformation of potassic feldspar by leached K_2O. Increase in Na_2O and $A1_2O_3$ corresponds to neoformation of albite. MnO leaching promote changes in helvite composition (richer in iron and zinc at this zone). Fe and Ti are constant. Si losses in zones 3-4 are expressive, linked to a transformation of quartz in albite. MgO gains are due to biotite sulfuration reaction. Fe and Ti are constant. Volume changes during albitisation is weak, in our estimation less than 7%. Albitization promotes inputs in Na, Al, Mg, P and Mn, remarkable outputs of K and Si and little losses of Ca. Fe and Ti remains steady.

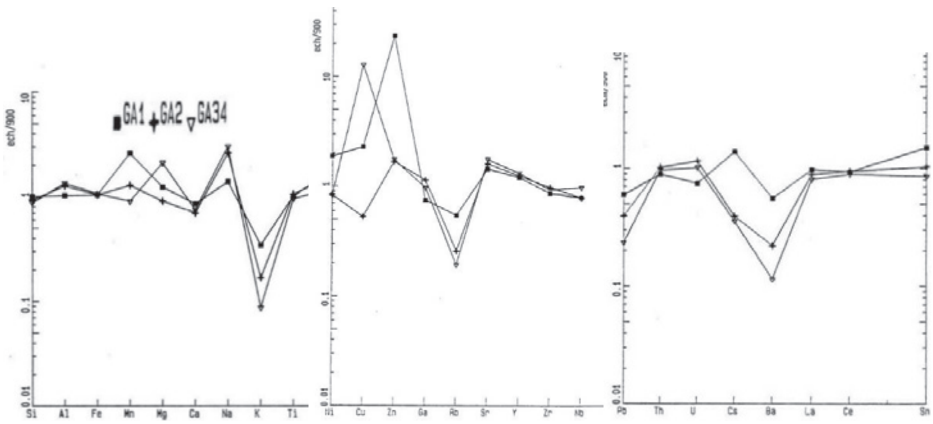


Figure 3 - Selected albitite elements normalized to a biotite bearing granite (sample n.900).

Trace Elements: In all zones the Zr/Ti ratio is the same as observed in the biotite bearing granite sample. Zr, La, Ce and Th contents are stable. Fluid inputs are mainly composed by Cu, Sr and U with minor amounts of Zn. Enriched elements are Rb, Ba, Li and Nb. Increase in Sr (36 ppm in GB and up to 63 ppm in albitite) and Na contents are connected to albite growing. The strontium substitutes calcium in plagioclase. Falls in Ba contents are due to potassic feldspar stability in zone 2 and almost complete disappearing Ba substitutions in the inner portions of the veins (K losses). Decreasing contents of Rb from GB (635 ppm) to inner zones of the albitite vein (122 ppm) are the responses to a complete substitution of potassic feldspar in albite of the inner zones and to a muscovite vanishing in zone 1 (345 ppm), cause rubidium is replaced by potassium in micas and K-feldspars.

DISCUSSION

The SUGM lithotypes are metaluminous and its biotite bearing granites are associated with albitites. These granites suffered previous deformations and fluid injections, with greisen formation, prior to albitization. Zones of later deformation could be related to withdrawal of metassomatic fluids leading to albitization. Both the geochemical constraints and key structural observations, like the systematic lack of albitite foliation (only few inherited relicts), points to a scenario where the late-magmatic liquid involved in albitite genesis may not be suitable to explain this process. Therefore, albitite formation postdate the episode of magmatism, greisenification and foliation.

Table 1 – Major (wt %) and trace (ppm) element analysis for albitite zones and Sucuri granitoid sample n.900.

FACIES	GB	GA11	GAZ	GA3	GA4	GA	GA	iGA
number	900	MSO	50	4	S2	880C	8800	880B
Si02	73.37	72.51	73.63	68.18	64.04	66.31	65.68	65.48
A1203	13.62	13.27	13.94	17.20	18.28	18.95	19.01	18.67
Fe203	2.32	2.33	2.40	2.40	2.46	2.28	1.95	2.36
MnO	0.04	0.03	0.10	0.05	0.03	0.05	0.05	0.04
MgO	0.10	0.11	0.12	0.09	0.21	0.09	0.08	0.11
CaO	0.85	0.61	0.72	0.59	0.63	0.85	0.62	0.75
Na20	3.90	3.97	5.44	10.15	11.71	10.80	9.36	9.44
K20	5.86	5.79	2.01	0.98	0.51	0.42	0.34	0.76
Ti02	0.18	0.18	0.18	0.19	0.17	0.17	0.15	0.17
P205	0.09	0.11	0.10	0.09	0.07	0.12	0.12	0.15
H20	0.06	0.06	0.08	0.18	0.12	0.04	0.08	0.06
PF	1.02	1.1»	0.74	0.52	0.74	0.86	0.68	0.48
Total	101.41	100.16	99.47	100.62	98.98	100.93	98.12	98.48
Ni	2.40	8.80	4.50	2.00	2.00	6.60	4.70	2.60
Cu	3.80	4.32	8.70	2.00	48.70	46.05	15.80	24.00
Zn	57.00	75.65	1342	96.20	99.40	102.00	33.30	153.00
Ga	31.00	29.30	23.20	35.20	30.10	21.40	26.80	30.70
Rb	635.00	575.10	345.00	162.70	121.90	77.20	50.20	151.00
Sr	36.00	38.30	51.80	58.00	63.40	69.40	69.60	73.60
Y.	104.00	137.20	126.00	129.70	136.90	133.00	146.00	138.00
Zr	202.00	190.20	175.00	197.70	188.10	183.00	205.00	182.00
Nb	90.00	88.84	71.30	71.00	88.30	85.80	86.30	71.00
Pb	37.50	45.85	22.30	14.70	8.70	23.60	11.20	34.80
Th	63.00	59.75	56.10	64.00	60.70	53.70	62.60	58.00
U.	15.50	14.85	11.50	17.80	15.70	19.70	23.40	14.60
Sn	24.50	38.35	36.80	25.30	21.00	7.90	11.00	15.60
Ba	286.00	312.90	158.00	62.70	32.70	50.60	69.90	92.10
La	117.00	118.20	114.00	103.60	94.60	93.00	111.00	113.00
Ce	220.00	230.70	205.00	208.50	196.60	187.00	207.00	202.00

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