Nd ISOTOPES OF GRANITOIDS OF SÃO ROQUE DOMAIN, SOUTHEASTERN RIBEIRA BELT, BRAZIL

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Financial support: FAPESP

INTRODUCTION

The Ribeira belt, in southeastern Brazil was formed in the Brazilian Orogeny, the South American equivalent of the Pan-African Orogeny (~700 - 450 Ma). The southern sector of the belt is characterized for major shear zone NE-SW separating several tectonics domains with distinct lithological, structural and metamorphic aspects: the Socorro-Guaxupé Nappe, the Alto Rio Grande Belt, the São Roque, Juiz de Fora, Embú and Costeiro domains (Figure 1). Large volumes of syn - and post-tectonic granitic rocks intruded between about 660 - 600 Ma all the domains, as indicated for U/Pb data (Tassinari & Campos Neto 1988, Basei *et al.* 1995, Ebert *et al.* 1995, Topfner 1996, Ragatky 1998). Sm/Nd isotope data was obtained on representative samples of granites intruded the São Roque Domain.

The São Roque Domain consists of two volcano-sedimentary sequences: the Serra do Itaberaba Group (anphibolitic facies metamorphism) and the underlying the São Roque Group (greenschist grade metamorphism). Both sequences are considerate rift-type (Dantas 1990, Juliani 1993). The granites studied are similar to those syn-orogenic bodies of southeastern Brazil: chemically they constitute a high-K calc-alkaline trend, are enriched in LILE and depleted in HFSE, with varied Eu negative anomaly, characterizing granites of subduction zone. Prevail rocks with granitic to granodioritic composition (porphyritic biotite ± hornblende granodiorites and biotite granites) grouped in small bodies, some weakly foliated.

ANALYTICAL RESULTS

Sm/Nd and Rb/Sr isotopic analisis of the representative samples of granites of the São Roque Domain was carried out in the Geochronological Research Center of São Paulo University. Results are in Table 1. The ε_{Nd} values for t (t = crystallization age) are moderately to strongly negatives (-6 to -14), compatible with elevated values of $^{87}Sr/^{86}Sr$ initial (0.706 to 0.711). Sm/Nd depleted mantle model (T_{DM}) varies from 2.0 Ga to 1.4 Ga. The observation of Table 1 shows two groups of T_{DM} and consistent ε_{Nd}: one with T_{DM} about 2.0-1.7 Ga, with ε_{Nd} values between -9 and -14, and other set with Mesoproterozoic T_{DM} (1.5-1.4 Ga) and concordly, less negative ε_{Nd} (~-8 to -5).

DISCUSSION

The 2.1 - 2.0 Ga time interval characterizes a major event of crustal accretion in the South Africa and South America and the 1.9 Ga in the world-wide (Condie 1997). However, in this region of Ribeira Belt no rocks of this crystallization age were registered. Thus, the T_{DM} can be advocated to: 1) a process of basic magma underplated in the lower crust which was subsequently submitted to fusion and different degrees of crustal contamination resulting in the generation of calc-alkaline granites; 2) the no recognized basement of São Roque Domain could be generated in the Transamazonian Cycle and the crustal reworking in the Brazilian Cycle generated the calc-alkalines granitoids. Indeed, the Transamazonian basement was identified in the central portion of the Ribeira Belt (U/Pb zircon ages, Machado *et al.* 1996).

To concern of 1.6 - 1.4 Ga interval, a simple explanation and current hypothesis is that it represents an episode of continental accretion during the Mesoproterozoic. Alternatively, such a interval could be the result of a crustal material mixing differenciated from the mantle in both older and younger epochs that the time concerned. Referring to the former alternative, the 1.6 - 1.3 Ga interval age was recognized in the Africa and Australia as a granitogenesis period. However, only the 1.3 Ga is recognized as time of crustal accretion (Condie 1997) and even few history cases are found in Brazil. To concern the second hypothesis, the material mixing could be between Paleoproterozoic and Mesoproterozoic. Although Brazilian T_{DM} ages were not identificated in the study area, crustal formation event is recognized a 0.7- 0.5 Ga in Africa and South America (Condie 1997).

Indeed, process including underplating of

basic and intermediate magma are advocated for the near calc-alkaline syn-orogenic granites of the Socorro- Guaxupé Nappe (Vlach 1996 Janasi *et al.* 1997).

The data presented here together the previously published (Tassinari & Sato 1996, Sato & Campos Neto 1996) for the southern Ribeira Belt show that, if juvenile crust was incorporated during the Brazilian Event, it appened in a few amounts. No evidences of Archaean basement was founded in the São Roque Domain.

REFERENCES

DANTAS, A.S.L. 1990. *Geologia da faixa São Roque e intrussivas associadas na região entre São Paulo e Mairiporã, Norte de São Paulo - SP.* 199 p. (Dissertação de Mestrado, Instituto de Geociências da Universidade de São Paulo). p. 1-2.

BASEI, M.A.S; SIGA JUNIOR, O.; SATO, K.; SPROESSER, W.M. 1995. A metodologia Urânio-Chumbo na Universidade de São Paulo. Princípios metodológicos, aplicações e resultados obtidos. *Anais da Academia Brasilera de Ciências,* 67(2): 221- 237.

CAMPOS NETO, M.C; FIGUEIREDO, M.C.H. 1995. The Rio Doce Orogeny, Southeastern Brazil. *Journal of South American Earth Sciences,* 8(2):143-162.

CONDIE, K. C. 1997. Episodic age distributions in the crust: significance for earth history. In: SOUTH-AMERICAN SYMPOSIUM ON ISOTOPE GEOLOGY, Campos do Jordão. *Ext. Abstr...,* São Paulo, p.147-150.

EBERT, H.D.; CHEMALE Jr. F.; BABINSKI, M.; ARTUR, A.C.; VAN SCHMUS, W.R.; 1996. Tectonic setting and U/Pb zircon dating of the plutonic Socorro Complex in the Transpressive Rio Paraíba do Sul Shear Belt, SE Brazil. *Tectonics,* 15 (2): 688-699.

JANASI, V.A.; HADDAD, R.C.; VLACH, S.R.F. 1997. Comments on the Sm-Nd isotope systematics of calc-alkaline granitoids from the Pinhal-Ipiúna batolith (São Paulo and Minas Gerais, Brazil). In: SOUTH-AMERICAN SYMPOSIUM ON ISOTOPE GEOLOGY, Campos do Jordão. *Ext. Abstr...,* São Paulo, p.147-150.

JULIANI, C. 1993. *Geologia, petrogênese e aspectos metalogenéticos dos grupos Serra do Itaberaba e São Roque na região das serras do Itaberaba e da Pedra Branca, NE da cidade de São Paulo, SP.* 2 vol. 803 p. (Tese de doutoramento, Instituto de Geociências da Universidade de São Paulo).

MACHADO, N; VALLADARES, C.S. HEILBRON, M.; VALERIANO, C.M. 1996 U-Pb geocronology of the central Ribeira Belt (Brazil) and implications for the evolution of the Brazilian Orogeny. *Precambrian Research,* 79: 347-367.

RAGATKY, D. 1998. *Contribuição à geoquímica e geocronologia da Nappe de empurrão Socorro-Guaxupé e do Domínio São Roque na região de Igaratá e Piracaia, São Paulo.* 130 p. (Tese de doutoramento, Instituto de Geociências da Universidade de São Paulo).

SATO, K.; CAMPOS NETO, M. 1996. Dados dos principais eventos de acreção manto-crosta continental no sudeste brasileiro, baseado em idades Sm/Nd In: CONGRESSO BRASILEIRO DE GELOGIA, 39, Salvador, 1996. *Anais...* Salvador,SBG. V. 6, p528-530.

TASSINARI, C; SATO, K. 1996. Idades de formação de crosta continental na parte sudeste do Estado de São Paulo, com base em dados Sm/Nd. In: CONGRESSO BRASILEIRO DE GELOGIA, 39, Salvador, 1996. *Anais...* Salvador,SBG. V. 6, p 489-491.

TASSINARI, C. C. G. & CAMPOS NETO, M. 1988. Precambrian continental crust evolution of southeastern São Paulo State - Brazil: based on isotopic evidences. *Geochimica Brasiliensis,* (2): 175-183.

TÖPFNER, C. 1996. *Brasiliano-Granitoide in den Bundesstaaten São Paulo und Minas Gerais - eine vergleichende Studie.* Müncher geologische Hefte A17, IAAG-Munich. 258 p.

VLACH, S.R.F. 1996. Geoquímica isotópica do Sr e do Nd em granitóides de Morungaba, SP: inferências genéticas e de evolução crustal. In: CONGRESSO BRASILEIRO DE GELOGIA, 39, Salvador, 1996. *Anais...* Salvador,SBG. V. 6, p. 610-611.

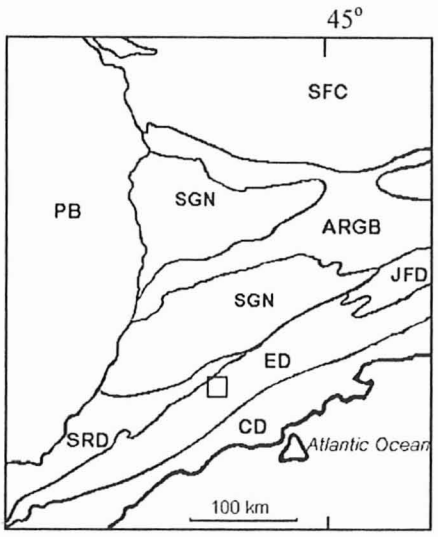

Figure 1: Main geological units of the southern Ribeira Belt: SFC = São Francisco Craton; ARGB = Alto Rio Grande Belt; SGN = Socorro Guaxupé Nappe; SRD = São Roque Domain; JFD = Juiz de Fora Domain; ED = Embú Domain; CD = Costeiro Domain. PB = Paraná Basin. (Adapted of Campos Neto & Figueiredo 1995).

□ Location of the studied area

	Sm (ppm)	Nd (ppm)	$^{147}Sm/^{144}Nd$ (± error)	$^{143}Nd/^{144}Nd$ (± error)	T_{DM} (Ga)	$\varepsilon_{Nd}(600)$
Barro Branco granite	7.76	51.92	0.09094 (5)	0.51162 (3)	1.8	-11.77
Pedra Branca granodiorite	9.8	55.75	0.10699 (7)	0.51163 (3)	2.0	-13.79
Moinho granodiorite	7.00	40.76	0.10450 (6)	0.51169 (3)	1.9	-11.29
Machado granite	13.92	111.67	0.07585 (4)	0.51148 (3)	1.7	-13.10
Boa Vista granite	5.91	40.19	0.08956 (5)	0.51175 (2)	1.5	-7.23
Morro do Pão tonalite	11.43	72.47	0.09595 (5)	0.51182 (22)	1.5	-8.15
Morro do Pão granodiorite	9.76	57.36	0.10359 (5)	0.51199 (5)	1.4	-5.38
Morro do Pão granite	10.40	73.28	0.08639 (5)	0.51181 (22)	1.4	-7.56
Imbiruçu granite	5.45	34.14	0.09722 (6)	0.51197 (2)	1.4	-5.56

Table 1: Sm/Nd isotopic results for the granitoids of the São Roque Domain, southern Ribeira Belt, Brazil.