

**Lu-Hf AND U-Pb AGE DETERMINATION OF THE CAPIVARITA ANORTHOSITE,
DOM FELICIANO BELT, RS, BRAZIL**

CHEMALE JR., F.^{1,2}, PHILIPP, R.P.², DUSSIN, I.A.³, FORMOSO, M.L.L.², KAWASHITA, K.³,
BERTTOTTI, A.L.²

farid.chemale@ufs.br

1- Núcleo de Geologia, Universidade Federal de Sergipe, São Cristóvão, SE, Brazil

2- PPGGEO, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil

3 – Centro de Pesquisas Geocronológicas, Universidade de São Paulo, SP, Brazil

ABSTRACT

Capivarita Anorthosite is exposed in the Pelotas Batholith as part of Brasiliano (Neoproterozoic to Eopaleozoic) magmatic arc, composed by anorthosite and subordinate metagabbros and amphibolites bodies and also cm to m-lenses of garnet rich material. Capivarita Anorthosite is metaluminous magmatism related to a tholeiitic series formed by crystal accumulation process in intraplate environment, later affected by the orogenic process of under medium to upper amphibolites facies.

Igneous and metamorphic ages obtained by U-Pb in situ dating on zircon, sphene and baddeleyite using LA-MC-ICPMS method are here first presented.

Palavras – Chave: U-Pb in situ dating, Lu-Hf zircon dating, Capivarita Anorthosite, Dom Feliciano Belt

INTRODUCTION

The Capivarita Anorthosite has firstly been described by Tessari & Picada (1966) and Ribeiro *et al.* (1966). Later, Formoso & Carraro (1968) described the main petrographic and mineralogical characteristics and its kaoline alteration product used for industry.

Formoso (1973) and Formoso *et al.* (1975) recognized three main bodies of the Capivarita Anorthosite as detailed the weathering alteration with production of Clay-mineral reserves. Fernandes *et al.* (1989) recognized the tectono-metamorphic processes that acted on the anorthosite and adjacent orto and paraderived gneissic complexes. A more comprehensive work has been presented by Philipp *et al.* (in press) who defined this body as typical intraplate igneous complex affected by the Brasiliano orogeny. However, until this moment there is not any reliable or even direct dating of the metamorphosed anorthosite complex.

In this work we dated the Capivarita Anorthosite by in situ LA-MC-ICP-MS method on zircon, titanite and baddeleyite grains in order to constrain the igneous and metamorphic ages of this body situated in the Dom Feliciano Belt, an orogenic belt formed during the Neoproterozoic (860-550 Ma).

RESULTS

The analyzed minerals (zircon, titanite and baddeleyite) are from samples coarse-grained anorthosite and metagabbro, which they have a clearly relationship of cogenetic magmatism. These minerals were dated at the Laboratório de Geologia Isotópica of the Federal Rio Grande do Sul University by the U-Pb and Lu-Hf methods (Chemale *et al.*, 2006).

Based on U-Pb isotope data of the anorthosite, the zircon grains are divided in three main groups: (i) inherited zircons (2028 ± 17 Ma), (ii) igneous zircons (1573 ± 21 Ma), and (iii) metamorphic zircons (606 ± 5.9 Ma) (Fig. 1). The baddeleyite yielded a $^{207}\text{Pb}/^{206}\text{Pb}$ age of 608 ± 14 Ma, which is herein interpreted as metamorphic age, too. It is noteworthy that the metamorphic zircons occur as individual crystals and as overgrowth on 1.57 Ga igneous zircon. The titanites have two groups, one darker and other lighter, but all analyzed grains contain large amount of common Pb. The obtained ages are 599.1 ± 5.2 Ma and 651.5 ± 8.8 Ma, interpreted to be metamorphic ones.

The second sampled rock corresponds to the metagabbro, from which two main groups of titanite were separated by means of microscopic and MEV analyses. The first one is made up of lighter titanite grains and yielded an age of 1530 ± 33 Ma, which is interpreted to be formed during the igneous event of the anorthosite generation. The second group corresponds to darker titanites and yielded an age 601.2 ± 5.2 Ma, which is interpreted as titanite formed under metamorphic conditions.

In order to get information on the provenance of the zircon from the anorthosite sample, we carried out Lu-Hf in situ LAM-ICP-MS analyses in the zircons which have been determined for U-Pb dating. The igneous zircons grains present two groups of TDM and Epsilon Hf (for $t = 1.57$ Ga) values. The juvenile zircons with Hf model ages ranging from 1.76 to 1.92 Ga and ϵHf from +2.64 to +6.48. The second group is made up of reworked zircons of a Paleoproterozoic source with Hf model ages between 2.17 and 2.24 Ga and ϵHf -

3.72 to -5.85. All dated metamorphic zircons have similar values for TDM and ϵ_{Hf} as those igneous juvenile zircons.

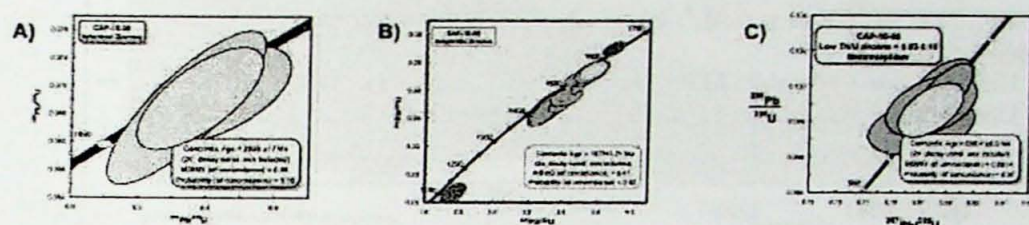


Figure 1. Concordia diagrams for the Capivarita Anorthosite with inherited (A), magmatic (B) and metamorphic zircons (C).

ACKNOWLEDGEMENTS

The presented results is directed linked with the efforts of more than 40 years of Prof. Milton Laquintine Formoso work, who never gave up in order to constrain precise and reliable igneous age for the Capivarita anorthosite. We thank also Maurício Carneiro and his team (UFOP) for heavy mineral separation of the analyzed samples.

REFERÊNCIAS

- CHEMALE JR., F.; KAWASHITA, K.; DUSSIN, I.A. & JUSTINO, D., (2008): Age Comparison Between U-Pb Zircon Dating with LA-MC-ICP-MS Using Mixed Detector Configuration and SHRIMP, *South American Symposium on Isotope Geology (VI-2008)*, San Carlos de Bariloche-Argentina, *Book of Extended Abstracts CD-Rom*, 2pgs
- FERNANDES, L.A.; TOMMASI, A.; PORCHER, C.C.; MARQUES-TOIGO, M. GUERRA-SOMMER, M. & A.M. PICCOLI. 1988. *Mapa geológico 1:50.000 de parte das folhas Quitéria e Várzea do Capivarita*, Instituto de Geociências, UFRGS, Porto Alegre.
- FORMOSO, M.L.L. 1973. *Geologia da folha Capivarita – RS, Anorthosito de Capivarita*. Ph.D. Thesis, Instituto de Geociências, Universidade de São Paulo, São Paulo, 215p.
- FORMOSO, M.L.L.; CARRARO, C.C. 1968. Anorthosito de Capivarita, Rio Pardo, RS. *Anais da Academia Brasileira de Ciências*, 40: 361-372.
- RIBEIRO, M.; BOCCHI, P.R.; FIGUEIREDO, F.P.; TESSARI, R.I. 1966. Geologia da Quadrícula de Caçapava do Sul, RGS. DNPM/DFPM, Rio de Janeiro, Boletim 127: 232 p.