

Age constraints and isotope signature of the Ediacaran Pb-Zn and Cu-epithermal deposits.

**Lucy Takehara¹, Marly Babinski², João Angelo Toniolo¹, Farid Chemale Junior¹,
Maurício Liska Borba^{1,5}, Felipe Guadagnin^{1,5}**

¹ CPRM, SUREG-Porto Alegre-RS, ²Universidade de São Paulo, ³ Programa de Pós-Graduação em Geologia, UNISINOS, São Leopoldo - RS.

Abstract

Epithermal Cu (Au) and Pb-Zn (Ag) mineral deposits of intrusion related source, hosted in siliciclastic sedimentary rocks of Ediacaran age, are investigated. Pb-isotopes of Cu- and Pb-Zn-mineralization and U-Pb Shrimp dating of interlayered intermediated lava provided interesting clues on the source of the mineralization. Most of the analysed sulphide minerals from Cu (Au) deposits display juvenile Neoproterozoic signature such as early Neoproterozoic ophiolite and island/magmatic arc and the later granite melting (0.6 Ga), while those sulphide minerals of Pb-Zn deposits contain a Paleoproterozoic signature. The analysed sulphides associated with Cu-mineralization show a Pb-isotope signature of a mixed source with mantle and upper crust and a low U-Pb ratio fluid. The Pb-isotope data support that the most probable source for Pb-Zn mineralization is associated with volcanic-sedimentary rocks of the Camaquã Basin with strong contribution of the melted Paleoproterozoic between 0.58-0.54.

GEOLOGICAL SETTING

The Camaquã Basin occurs in the central part of the Sul-Riograndense Shield, Rio Grande Sul State, overlying the Paleoproterozoic and Neoproterozoic basement rocks (Chemale Jr. et al 1995, Paim et al 2000). The Camaquã Basin is locus depositional basin formed between 630 and 500 Ma, from the base to the top: Maricá Group (<630

to >594 Ma) , the Bom Jardim Group (594 Ma to 580 Ma), the Acampamento Velho-Santa Bárbara Group (574 Ma-547 Ma) and the Guaritas Group (547 Ma-500 Ma. The first depositional cycles, the Maricá Fm., starts with alluvial fans to braided alluvial sediments that grade up into shallow-marine to turbidites sediments. It is interpreted to be formed as result of Dom Feliciano Belt overload in a retro-arc tectonic setting (Paim et al. 2000). Overlying the Maricá Formation are the three continental sequences, formed under the post-collisional stages of the Brasiliano Cycle, between 595 to ~500 Ma. The basal is the Bom Jardim Group, a volcano-sedimentary sequence formed from 595 to 578 Ma. Overlying in unconformity are the Acampamento Velho Fm., basal alkaline volcanic association, and the Santa Bárbara Group, a fluvial-deltaic-lacustrine sequence, formed from 578 to 540 Ma, and contains the fault-controlled Cu and Pb-Zn mineralization. These units are covered by the Guaritas Group comprising aeolian and alluvial plain and fan deposits (~547 to 500 Ma). Based in situ U-Pb dating the sedimentary host rocks are deposited between 573 ± 9.7 Ma (Fig. 1) and 547 ± 6 Ma, which it is the age of the hydrothermal process controlled by normal faults oriented at N60°-70°W and N-S.

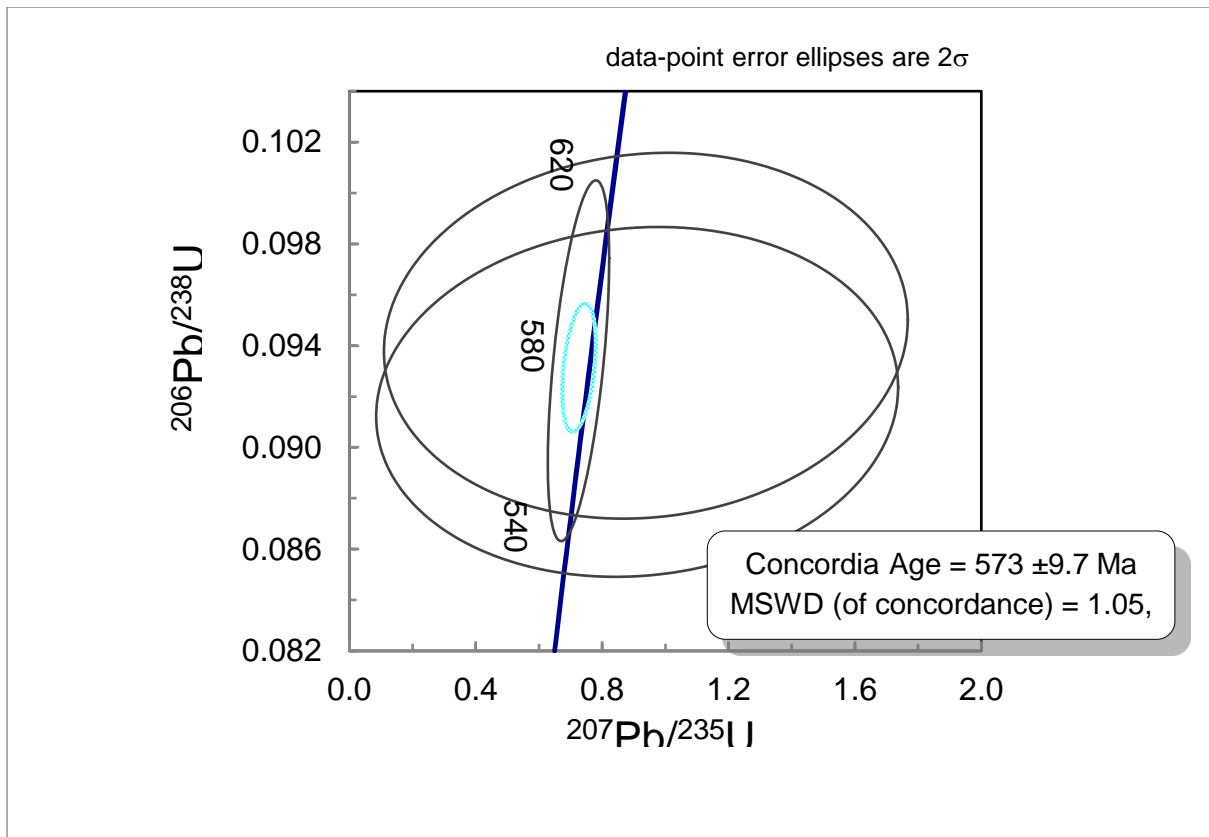


Figure 1. U-Pb SHRIMP age for the intermediate volcanic lava of the siliciclastic hosted Cu-deposits.

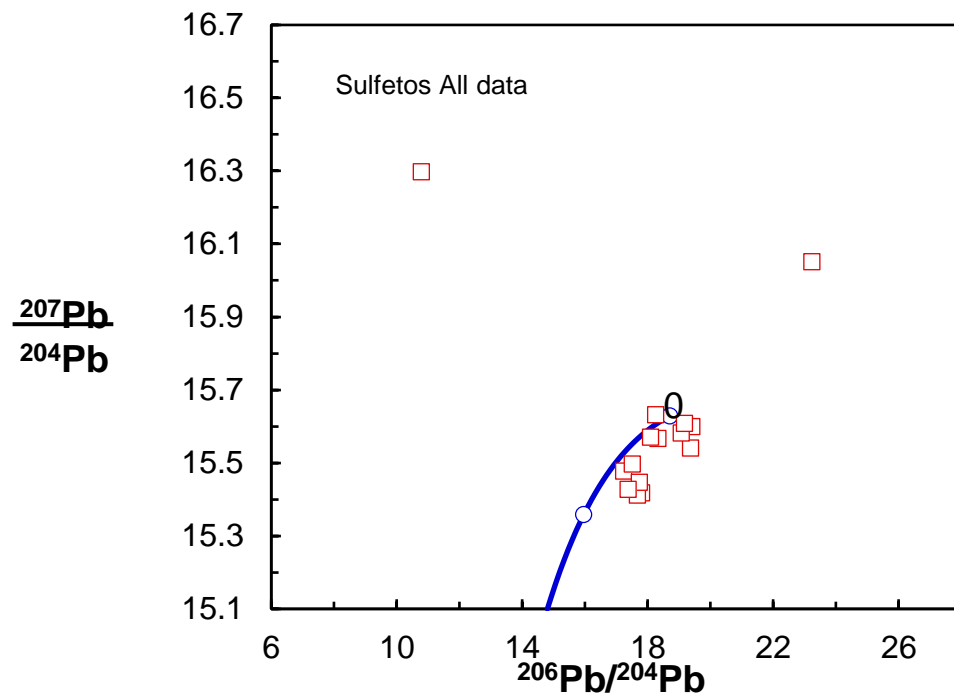


Figure 2. $^{206}\text{Pb}/^{204}\text{Pb}$ x $^{207}\text{Pb}/^{204}\text{Pb}$ diagram for the sulfides of the Camaquã Cu-deposits

RESULTS AND DISCUSSION

Most of the analysed sulphides associated with Cu-mineralization have a signature associated with the Neoproterozoic rocks of the Dom Feliciano Belt showing a mixed source with mantle and upper crust (orogenic environment after Zartman & Doe, 1981) and a low U-Pb ratio fluid (Fig. 2). The sulphides associated with Pb-Zn metal deposits have isotope signature of the Paleoproterozoic Santa Maria Chico Granulite Complex, Paleoproterozoic gneisses of the Santa da Boa Vista Dome and may have a direct link with crustal source for the 0.58-0.547 Ga Acampamento Velho magmatism (with dominant Paleoproterozoic Nd model age).

References

- Paim, P. S. G., Chemale Jr., F. & Lopes, R. C. 2000. A Bacia do Camaquã. In: Holz, M. & De Ros, L.F. 2000. Geologia e Estratigrafia do Rio Grande do Sul, Editora UFRGS, Porto Alegre, 231-272
- Zartmann, R.E. and Doe, B.R. (1981) Plumbotectonics – the model. *Tectonophys.*, v. 75, pp. 135-162.
- CHEMALE JR., F.**; HARTMANN, L.A. & SILVA, L. C. 1995 Stratigraphy and Tectonism of Brasiliano Cycle in Southern Brazil. In : McMANUS, M. N. C.; HOAL, B. G. & HEGENBERGER, W. (Eds.) Proterozoic Crustal and Metallogenic Evolution, Communications Geological Survey of Namibia vol. 10, Special Issue: 151-166.