AGE CONSTRAINTS AND ISOTOPE SIGNATURE OF THE EDIACARAN PB-ZN AND CU-EPITHERMAL DEPOSITS, MINAS DO CAMAQUÃ, BRAZIL

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Summary

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- Ore minerals
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Introduction

- The Minas do Camaquã orebodies are hosted by sandstone and conglomerate of the Neoproterozoic to Early Paleozoic Camaquã basin.
- The Camaquã basin was initially marine and progressively changed into a definite continental environment.
- The ore consists of massive sulfides in veins, pipes and stringers, and disseminated sulfides.
- The sulfide paragenesis in the primary ore consists of chalcopyrite, bornite, chalcocite, and pyrite.
Simplified geologic map of Uruguayan - Sul-Rio-Grandense Santa Catarina Shield

Geological context

Simplified geology of the Sul-Riograndense shield (Laux et al., 2005)
Geological context

The Camaquã Basin is locus depositional basin formed between 630 – 500 Ma, from the base to the top:
- Marica Group (<630 to > 594 Ma)
- Bom Jardim Group (594 Ma to 580 Ma)
- Acampamento Velho – Santa Bárbara Group (574 Ma to 547 Ma)
- Guaritas Group (547 Ma to 500 Ma)

Simplified geology of the Camaquã Basin (Almeida et al., 2012)
**Geological context**

Geological and structural map of Minas do Camaquã region (Bicca, 2013).

**Cu (Au) and Pb-Zn Deposits**

Mineralization with strong structural control (ductile-brittle), associated with transtensional zones of 2ª order.

Hidrothermal alteration controls the distribution of metals

Hidrothermal alteration zoning : (1) illite $\rightarrow$ Pb-Zn (2) chlorite$\rightarrow$ Cu (Au).

(Samuel Lago, 2013).
Cu (Au) and Pb-Zn Deposits context

Vertical section of Santa Maria and Minas do Camaquã deposits with related hidrothermal alteration (Modif. Santos, 2011, Nexa metals).

Cu (Au) Deposit context

Minas do Camaquã Deposit (Laux et al., 2005).
Cu (Au) Deposit context

Open pit of Uruguay Mine - Copper (Au) deposit (Chemale Jr, 2014)

Hydrothermal alteration (Lindenberg, 2014).

Level 180, Uruguay Mine (Minas do Camaquã, RS). Breccia with calcocite as cement, in fault zone (Laux, 1995)

Nível 220, Uruguay Mine (Minas do Camaquã, RS). Breccia with cpy as cement, in fault zone (Laux, 1995)
Cu (Au) Deposit context

Stringer ore

Disseminated ore

Pb-Zn Santa Maria Deposit (Samuel Lago, 2013).

Conglomerate

Arenite

Ritmite

Illite

Chlorite

Stringer ore: >3% Zn+Pb
Vertical and lenticular body

Disseminated ore: 0.5% >Zn+Pb< 3%
Stratiform, thick and cover the stringer body

Samuel Lago, 2013
Ore minerals

Microphotography of ore minerals (Pb, Cu and Zn sulfides)

U-Pb age

547±6Ma is the age of the hydrothermal process controlled by normal faults oriented at N60°-70°W and N-S.

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

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

$^{208}\text{Pb}/^{206}\text{Pb} \times ^{207}\text{Pb}/^{206}\text{Pb}$ diagram for the main units of the Sul-Rio Grandense Shield and sulphide mineralization (Takehara et al., 2010)

Conclusion

- 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.

- 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 Paleoproteroic between 0.58-0.54.