

YAO Chunyan, DONG Yongguan, ZENG Yong, GUO Weimin, SHEN Mangting, XU Ming, 2014. Ore Control Factors of the High-grade BIF of the Carajás Iron Province in Brazil. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 130-131.

Ore Control Factors of the High-grade BIF of the Carajás Iron Province in Brazil

YAO Chunyan, DONG Yongguan, ZENG Yong, GUO Weimin, SHEN Mangting, XU Ming

Nanjing Center, China Geological Survey, Nanjing, 210016, China

1 Introduce

The Carajás mineral province is a highly mineralized metallogenic province that lies at the southern margin of the Southern Amazon Craton in Brazil (Fig.1b). It is comprised of two Archean tectonic blocks, the older southern Rio Maria granitoid-greenston terrain (Huhn et al., 1988) and the northern Itacaiúnas Shear Belt (Araújo et al., 1988). The Itacaiúnas Shear Belt contains giant supergene-enriched iron and manganese deposits (Gibbs and Wirth, 1990). The quantity of the deposits amount to

60, and they are divided into south and north. Up to now, only north deposits were open pitted.

2 The Carajás Mineral Province Precambrian High Grade Irons

The Carajás mineral province of the Central Brazil contains numerous economic high-grade hematite deposits where millimetre to centimeter scale magnetite and chert layers of late Archean banded iron-formation (BIF) have been converted to oxidized iron minerals

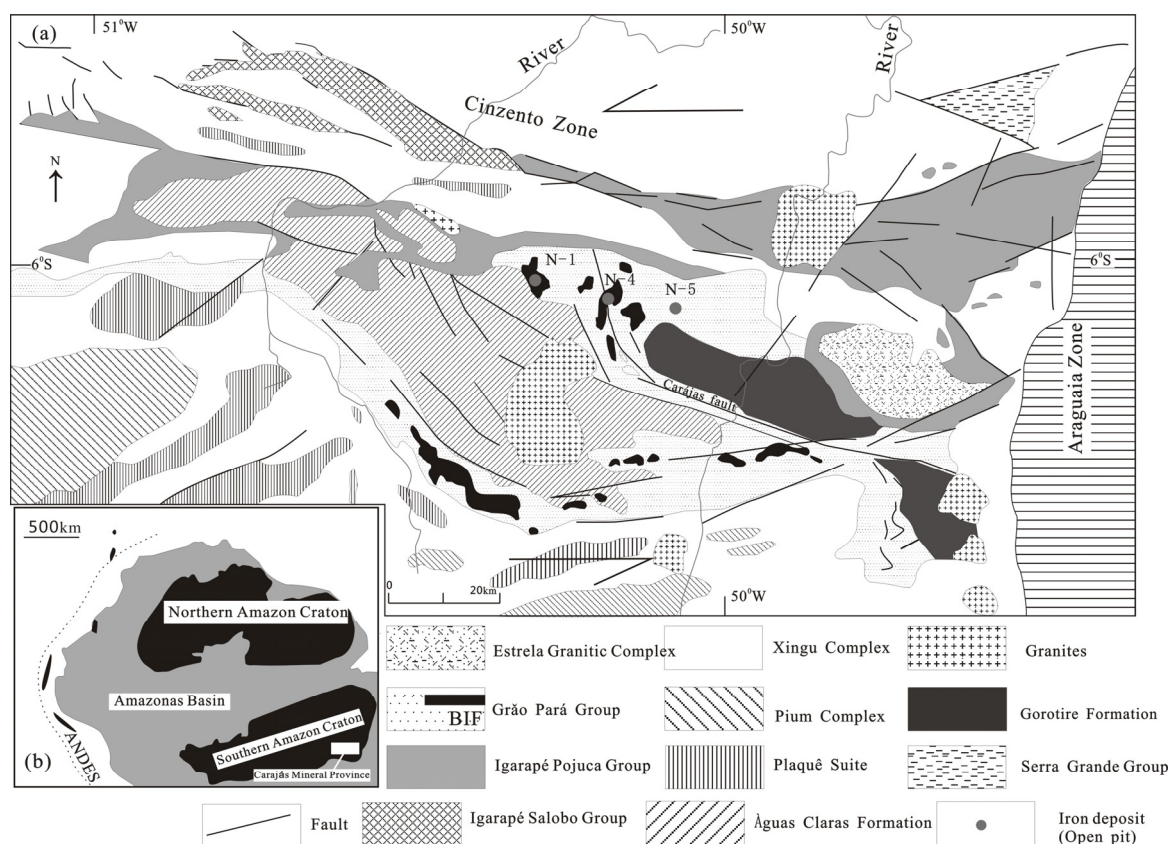


Fig.1 Geological map in Carajás area (a), Geological overview of the Carajás region (b)(modified after Barros and Barbey, 1998; Grainger et al., 2008)

* Corresponding author. E-mail: ycyan@126.com

(Figueiredo e Silva, et al., 2013). The wealth of iron deposits are comprised of the giant Serra Norte (N1-N9), Sul (S1-S45), and Leste (Fig. 1a).

The high grade iron orebodies of the Serra Norte deposits occur in the Carajás Formation of the Grão Pará Group (ca. 2.7 Ga), with grades of 66%–69% (Fe). Meanwhile, the iron orebodies are mainly located along the contact between the protore jaspilites and lower mafic wall rocks (such as basalts and gabbros) (Figueiredo e Silva, 2009). Ore types at the Serra Norte deposits include soft and hard ore. The soft ore is mainly consist of hematite, and generally characterized by thin laminations and often with strong internal deformation. The hard ore consists of banded, massive and /or brecciated hematite ores, and is mainly located along the contact with the surrounding hydrothermally altered basalts.

3 Ore Control Factors of the High-Grade BIF in the Carajás Iron Province

According to Figueiredo e Silva, et al. (2013), there are different hydrothermal alteration zones which compose of veins and breccias around hard ores. The zones can be separated into three alteration zone, including (1) an early alteration zone (distal portion of orebodies); (2) intermediate alteration zone (the main iron ore-forming event); (3) proximal alteration zone (high-grade iron ore, hematite) (Figueiredo e Silva, et al., 2013). $\delta^{18}\text{O}$ values are from -9.5‰ to -2.4‰ in proximal alteration zone, indicating the progressive mixture of descending heated meteoric water with ascending modified magmatic fluids (Taylor, 1997). The distribution of the iron orebodies is almost controlled by the Carajás fault or the folds in the north deposits (Fig. 1a). The faults or the folds are not only controlled the orebodies but also migration pathway of the fluid. In the open pitted deposits, the type of ores is soft hematite ore with lenses of hard ore. The soft hematite ores are the product of progressive weathering and SiO_2 leaching (Rosière and Chemale, 2000).

Combined geological character, alteration fluid, and ore features, it can be concluded that the ore control factors of the high grade hematite almost including (1) hydrothermal fluid; (2) tectonism such as fault and fold; and (3) supergene weathering.

Acknowledgements

The work is financially supported by the geological survey project of “Geological setting, mineralization, and prospecting potential of the important mineral deposits in South American giant metallogenic belt” (121201220909).

References

- Araújo, O.J.B., Maia, R.G.N., João, X.S.J., and Costa, J.B.S., 1988. A megaestruturação arqueana da folha Serra dos Carajás: Congresso Latino-Americano de Geologia, 7th, Belém, Anais, 1:324–328.
- Barros, C.E.M., and Barbey, P., 1998. A importância da granitogênese tardiarqueana (2.5 Ga) na evolução tectono-metamórfica da Província Mineral de Carajás—O Complexo Granítico Estrela e sua auréola de contato. *Revista Brasileira de Geociências* 28 (4): 513–522.
- Figueiredo e Silva, R.C., 2009. Evolução e gênese do minério de ferro hidrotermal nos depósitos da Serra Norte, Província Mineral Carajás: Unpublished Ph.D. thesis, Belo Horizonte, Brazil, Universidade Federal de Minas Gerais, Departamento de Geologia, 236.
- Figueiredo e Silva, R.C., Hagemann, S., Lobato, L.M., Rostere, C.A., Banke, D.A., Davidson, G.J., Vennemann, T., and Hergt, J., 2013. Hydrothermal fluid processes and evolution of the giant Serra Norte jaspilite-hosted iron ore deposits, Carajas Mineral Province, Brazil. *Economic Geology*, 108: 739–779.
- Gibbs, A.K., and Wirth, K.R., 1990. Geologic setting of the Serra dos Carajás iron deposits, Brazil. In: Chauvel, J.J. (Ed.), *Ancient Banded Iron Formations (Regional Presentations)*. Theophrastus, Athens, 83–102.
- Grainger, C.J., Groves, D. I., Tallarico, F. H. B., Fletcher, I.R., 2008. Metallogenesis of the Carajás Mineral Province, Southern Amazon Craton, Brazil: Varying styles of Archean through Paleoproterozoic to Neoproterozoic base – and precious-metal mineralization. *Ore Geology Review*, 33: 451–489.
- Huhn, S.R.B., Santos, A.B.S., Amaral, A.F., Ledshan, E.J., Gouveia, J.L., Martins, L.P.B., Montalvão, R.G.M., and Costa, V.G., 1988. O terreno ‘granito-greenstone’ da região de Rio Maria-sul do Pará: Congresso Brasileiro de Geologia, 35th, Sociedade Brasileira de Geologia, Belém, Brazil, 1438–1452.
- Rosière, C. A., and Chemale, F., 2000. Brazilian iron formations and their geological setting: *Revista Brasileira de Geociências*, 30: 274–278.
- Taylor, H. P. Jr. 1997. Oxygen and hydrogen isotope relationships in hydrothermal mineral deposits, In: Barnes, H.L., (ed.), *Geochemistry of Hydrothermal Ore Deposits*, 3rd ed.: New York, John Wiley & Sons, 1–972.