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Petrographic and Fe Isotopic Constraints on the Genesis of the Shilu Fe Ore Deposit in Hainan Province, China

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1 Introduction

The Shilu Fe ore deposit in Hainan province, China, is known as the richest Fe-ore deposit in Asia. This deposit comprises hematite-rich Fe-ores, locally with magnetite-rich Fe-ores and subordinate Co, Cu, Ni, Pb–Zn and Ag resources, as well as dolomite, barite, gypsum and sulfur. The ores are hosted in dolomite marble of Neoproterozoic Shilu Group. The deposit consists of many lens-shape Orebodies, with the largest one named as Beiyi Orebody, which possess nearly 80% iron resources of the Shilu deposit. The iron ores are mostly high-grade hematite ores, associated with some low-grade hematite-magnetite ores and jasper. The deposit was overprinted by multi-stages of metamorphism and deformation (SCISTCAS, 1986; Xu et al., 2013).

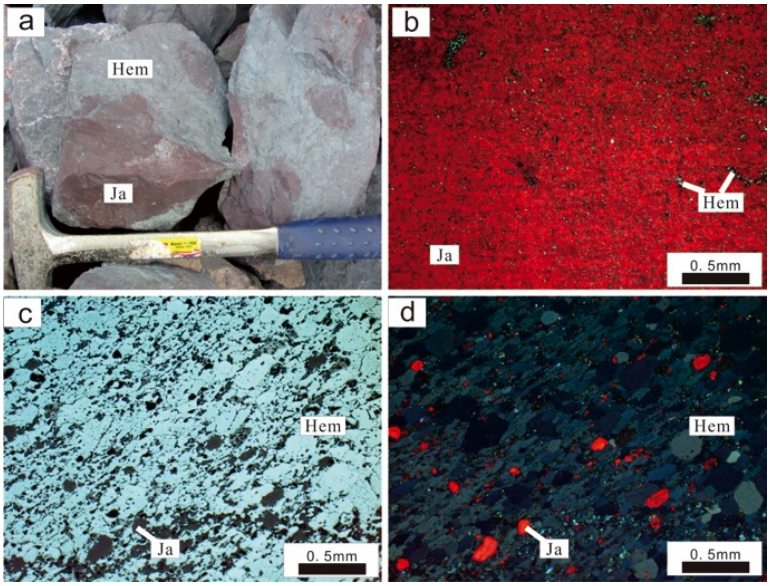

Fig. 1. Photos of jasper and Fe ores from the Shilu deposit.
(a) Jasper in high-grade Fe ore; (b) Photomicrograph of jasper showing fresh red color and cryptocrystalline texture with disseminated fine hematite, with cross-polarized reflected light; (c) high-grade Fe ore, showing lepidoblastic hematite and fine jasper grains, with reflected light; (d) the same sample as e, with cross-polarized reflected light. Hem, hematite; Ja, jasper.

Its genesis is still unclear due to its complicated geological characteristics. Several models have been proposed: 1) high-temperature hydrothermal origin (skarn type deposit). It is suggested that the ores were formed as a result of high-T hydrothermal contact-metasomatism; 2) Magmatic-volcanic origin. It is believed that the ores were actually erupted volcano. 3) Exhalative sedimentary origin. The ores were resulted from the volcano-related exhalation, overprinted by multiple stages of memorphism and deformation (SCISTCAS, 1986).

Here the jasper, especially the fine-grained jasper that may not be detected by naked eye, and Fe ores from the deposit are carefully investigated for their geological characters. Based on these, the Fe isotope compositions of the jasper and ores were investigated. The results provide robust evidence for the exhalative sedimentary origin of the original deposit.

2 Japer and its Significance

Spare jasper with lens-like shape being distributed in the outcrop (Fig. 1a), it is also found under the thin sections that fine-grained jasper is widely distributed in most low-grade and high-grade Fe ores (Fig. 1b, c, d), indicating a genetic relationship between the jasper and the Fe ores. The jasper is thus an important part of the ore

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deposit. As jasper is a kind of chemical sediment that is formed related to volcanic hydrothermal fluid activities, this finding reveals that the Shilu deposit is actually a Si-Fe formation originally formed by volcanic exhalation.

3 Fe isotopic Constraints on the Genesis of the Deposit

Samples of iron ores, including jasper, high-grade iron ores and low-grade iron ores, from Beiyi Orebody of Shilu deposit were collected for Fe isotope analysis. The results are plotted in Fig. 2. Overall, the Fe isotopes of iron ores have positive δ^{56}Fe values, varying from ca. 0‰ to ca. 1.5‰. The Fe isotopes vary regularly for iron ores from different layers. There are three layers of iron ores in Beiyi Orebody. The iron ores from the lower layer have δ^{56}Fe values of ca. −0.2‰ to 0.2‰; those from the middle layer have slightly positive δ^{56}Fe values of ca. 0.2‰ – 0.4‰; whereas those form the upper layer have the most positive δ^{56}Fe values of ca. 1‰–1.5‰. For different types of iron ores in the same layer, including jasper, high-grade iron ores and low-grade iron ores, however, have near the same Fe isotope compositions.

Fe isotopes of iron ores from the Shilu deposit are compared with those from the different types of iron ore deposit. It shows that the Fe isotope characters of Shilu iron ores are similar to those of the Precambrian sedimentary iron formations, but totally different from those of igneous rocks or deposits.

In summary, Fe isotope geochemistry of Shilu deposit supports that the original deposit was formed by chemical sedimentary process.

4 Conclusions

Petrographic study shows that both in outcrop scale and micro scale, jasper is widely distributed in most iron ores of Shilu deposit. Fe isotope geochemistry supports that the iron ores were formed by chemical sedimentary process. These evidence demonstrate that the Shilu deposit was originally of exhalative sedimentary origin.

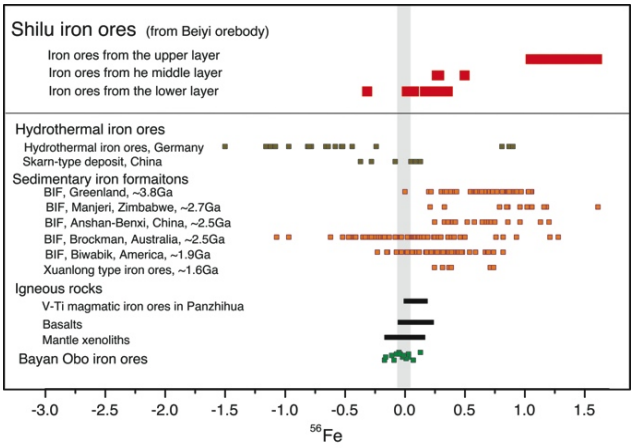

Fig. 2. Fe isotope compositions for iron ores from Shilu deposit (data from this study) and other deposits (data from literatures, see Sun et al., 2013).

Acknowledgements

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References

SCISTCAS (South China Iron-rich Scientific Team, Chinese Academy of Sciences), 1986. *Geology and Geochemistry of the Shilu Fe Ore Deposit in Hainan Island*. Beijing: Science Press (in Chinese).

Sun, J., Zhu, X., Chen, Y., and Fang, N., 2013. Iron isotopic constraints on the genesis of Bayan Obo ore deposit, Inner Mongolia, China. *Precambrian Research*, 235: 88–106.

Xu, D. R., Wang, Z.L., Cai, J.X., Wu, C.J., Bakun-Czubarow, N., Wang, L., Chen, H.Y., Baker, M.J., and Kusiak, M.A., 2013. Geological characteristics and metallogenesis of the Shilu Fe-ore deposit in Hainan Province, South China. *Ore Geology Reviews*, 53(0): 318–342.