Paper Number: 5307

The sources of ore-forming materials from the Anqing skarn type Cu-Fe deposit, Anhui Province, China

Yang, G.S. [1*], Yan, Y.F.[1], Wen, H.J.[2]

1 Kunming University of Science and Technology, Kunming 650093, China,
*correspondence: 13049706@ qq.com
2 Institute of Geochemistry, Chinese Academy of Science, Guiyang 550002, China

---

The Anqing skarn Cu-Fe deposit is representative in the Tongling-Anqing ore concentration area, an important Cu-Fe metallogenetic belt along the middle-lower reaches of the Yangtze River. The trace elements and S, C, O isotope compositions of the Anqing Cu-Fe deposit are discussed in this paper in an effect to understand the sources of the ore-forming materials.

The ore-bodies occur in the contract zone between the Yueshan diorites and the Middle-Lower Triassic carbonate rocks. The ore-bearing skarns and altered diorites contain variable contents of trace elements, but generally have a similar variation trend, such as systematic enrichment of Cu, Fe, Th, U, LREE, and depletion of Ba, Sr, Nb, Zr and Hf. The Triassic wall rocks contain lower ore-forming elements (Cu<10 ug/g, TFe <5%), with Sr, U enriched and Ba, Nb, Zr depleted; and there are no large-scale migration of the ore-forming elements in the surrounding sedimentary rocks [1]. Therefore, the ore-forming elements from the Triassic wall rocks are very limited, most of them are mainly derived from the deep-seated dioritic magma.

The $\delta^{34}S_{CDT}$ values of the ores show a total range from -5.5 to +10.6 ‰, with disperse distribution in coexist minerals, which is different from the directly related Yueshan diorites (+3.5 ~ +4.8 ‰) and Triassic wall rocks (+25.4 ~ +34.4 ‰). It shows that S isotope fractionation has not reached equilibrium in hydrothermal fluids for the Anqing deposit. The variations of the $\delta^{34}S_{CDT}$ values in sulphide ores are probably resulted from the compositional variation of sulphur at the sources and water–rock interaction between the ore-forming fluids and the sedimentary wall rocks [2]. The sulphur may come mainly from the diorites and some pre-Triassic wall rocks with negative $\delta^{34}S_{CDT}$ values.

The $\delta^{13}C_{PDB}$ and $\delta^{18}O_{SMOW}$ values of the Anqing deposit show similar variation trend from the diorites to the surrounding carbonate rocks. The $\delta^{13}C_{PDB}$ values increase gradually from the ore-bearing skarns (average -3.30 ‰) to altered Triassic marbles (average -0.40 ‰), then to far-ore unaltered carbonate rocks (average +1.50 ‰). In the diagram of $\delta^{18}O_{SMOW}$ vs. $\delta^{13}C_{PDB}$, the carbon of calcites from ore-bodies and skarns show mixed genetic features of magma and sedimentary rocks by pyrometasomatism and alteration. The average $\delta^{18}O_{SMOW}$ values from the diorites to the wall rocks are increased from +8.3 ‰ (for diorites) to +9.8 ‰ (for skarns), then to +14.80 ‰ (for near-ore marbles), then to +17.24 ‰ (far-ore carbonate rocks).

The C and O isotope compositions indicate the carbon and oxygen isotopic exchanges are widely occurred among the fluids, skarns diorites, and wall rocks in the mineralization process. However, the magnetite ore-bodies and early anhydrous skarns of in the external contact zone have lower $\delta^{18}O_{SMOW}$ values (average +4.2 and +7.0 ‰, respectively) than the others, combined with the clear boundary between the magnetite ore-bodies and near-ore marbles in the external contact zone, indicating that

they should not be formed by metasomatism, but by injection. The iron is probably derived from the magmatic fluids (ore pulp) with low $\delta^{18}O_{SMOW}$, which are separated from the dioritic magma by immiscibility in shallow magma chamber.

The research is supported by the National Natural Science Foundation of China (NO. 41103026 and NO. 41373050).

References:

[1] Pan Y M and Dong P (1999) Ore Geol. Rev. 1(5):177-242.
[2] Zhou T F et al. (2007) Ore Geol. Rev. 31(1-42): 2799-3034.