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Study on Characteristics of Ore-forming Fluids in Chifeng-Chaoyang Gold Belt, Northern Margin of North China Platform

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The study area is located at the binding site of the North China Craton and Xingmeng orogenic belt (Fig.1) (Cheng Yuqi, 1994). This area is an important gold-producing area in China with wide development prospects which has more than 10 medium-large gold deposits and more than one hundred gold occurrences.

1 Geological Evolution

According to the study of geological setting and geodynamic evolution, it's suggested that the North China Craton had gone through three stages as followed as: 1. the formation of the Precambrian crystalline basement; 2. the formation of sediments in the stable block from the Proterozoic to Paleozoic and 3. activation of the block from the Mesozoic to Cenozoic. When paleo-asian ocean closed, the "Scherer" collision took place in North China plate and Siberia plate. The paleo-asiatic tectonic domain turned into the round Pacific Ocean tectonic field. Both of them showed characteristics as extrusion in the early time and stretching in the late time since Mesozoic.

2 The Characteristics of Deposit and Ore-forming Fluid

It was no selectivity for gold mineralization to ore wall rocks, the ore wall rocks include the Archean metamorphic rocks, the Proterozoic and Mesozoic granite as well as Mesozoic volcanic. Although their ore-bearing rocks were different, the ore-forming material sources are similar. Considered from the perspective of ore-hosting rock, the Archean metamorphic made the biggest contribution to the mineralization, followed by the Mesozoic granites, and the Mesozoic volcanic rocks had no directly relationship. In the aspect of structure, the

regional translithospheric fractures control the distribution of the deposits and secondary fault zones or ductile shear zones control the distribution of the ore bodies.

The results of fluid inclusions microthermometry showed that fluid inclusions were gas-liquid two-phase, pure CO₂ inclusions were not well developed, or absent in most deposits. Gas-liquid two-phase inclusions were generally small concentrated between 4 and 8 microns and gas-liquid ratio range from 15% to 30%. the ore-forming fluids had the characteristics of low temperature (150°C ~350°C), low salinity (1~10wt%NaCl) and low-density. Raman analysis showed that the gas component is mainly H₂O, CO₂ secondly and it may contain a small amount of CH₄ and they belonged to H₂O-CO₂-NaCl fluid system generally. According to standardized calculation of the part of deposits mineralization pressure, we know that metallogenic pressure range of all gold deposits except Dongfeng and Anjiayingzi gold mine was from 50 MPa to 70MPa, most of them were between 10 to 35MPa; Metallogenic depth range was from 1km to 3.6km, showing a low-pressure environment and a shallow mineralization. On the whole, the orogenic gold deposits in this area are forming in a shallow systematic.

3 Material Source

Hydrogen and oxygen isotope characteristics showed that there were some differences among gold deposits. on the whole, the ore-forming fluid were mainly from magma in the early stage, joined by meteoric-water later; C isotopic characteristics show that ore-forming materials is closely related to deep magmatic activity, especially granitic magma activity; S isotope characteristics indicates that sulfur of the orebodies come from the magma which inherited that the Archean metamorphic sulfur isotopic compositions came from the place below the crust or mantle-derived, Pb isotopic

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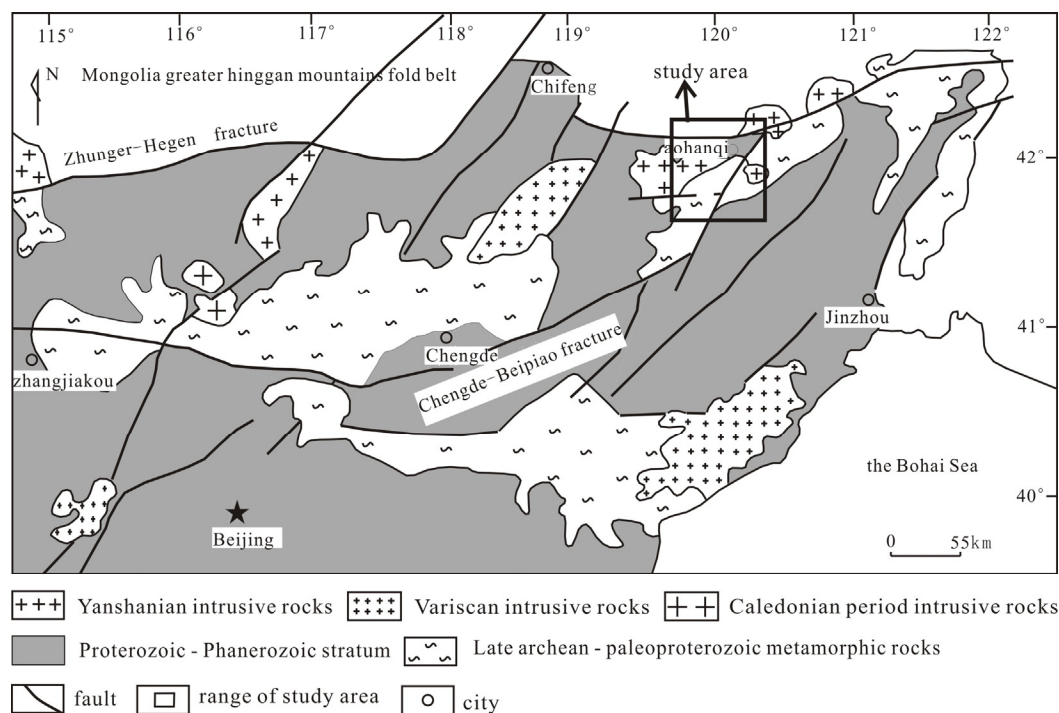


Fig. 1. Tectonic map showing location of study area

characteristics showed that gold deposits formed in orogenic environment, mantle-derived magma mixed hybridism with the lower crust during ascent, brought in some lower crust Pb, but mainly is mantle-derived lead. Meanwhile, by analysis of Pb isotopic of partial rock-mass, we found the sources of ores and intrusive rock were similar. By the study of intermediate-acid intrusives related to orogenic gold deposits in the study area, we know that granites had close relationship with various gold deposits which was the near-surface response for the multiple tectonic-magmatic activity in the region and it is also a sign of formation of orogenic gold deposits in the margin of the North China Platform. Meanwhile it is one of the main features of orogenic gold deposits in this area. And the intermediate-acid intrusives can provide macro clues for prospecting in the region.

Acknowledgements

According to the studies of geological background, geological characteristics, characteristics of fluid inclusions and isotopic, diagenesis, metallogenic epoch of the study area, the gold deposits in this area were orogenic gold deposits. Compared with the typical

orogenic gold deposits at home and abroad, their characteristics are as following: ① Tectonic positions were in the orogenic belts; ② Ore-controlling structures were mostly secondary ductile brittle shear zones produced by regional deep faults; ③ Intrusive rocks and dikes in mining area developed well, and related with the mineralization closely; ④ There existed some similarities in the sulfide mineral assemblages and wall rocks alteration; ⑤ Metallogenic epoches were consistency.

And the significant uniqueness are as following: ① Mineralization background was multi-stage and multi-stage orogenic belt at the edge of the North China Craton which underwent damage; ② Mineralization occurred in the system of shallow (<6km), on the whole that they had low-temperature, low-voltage characteristics of the mineralization; ③ Ore-forming fluids were mainly the system of H₂O-CO₂-NaCl, showing the characteristics of shallow sub-class orogenic gold deposits fluid; ④ Mineralization types were mainly of quartz vein type followed by alteration type.

References

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