High salinity CO_2-rich magmatic fluids: Features of the East Qinling-Dabie porphyry Mo belt, China

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Porphyry deposits are most commonly discovered in continental and oceanic arcs, and generally contain coexisting high-salinity brine and low salinity aqueous vapor [1, 2]. The East Qinling-Dabie orogenic belt contains several Yanshanian Mo deposits that developed after the continental collision between the North China Craton and the Yangtze Craton at Meozoic [3, 4]. Most of these Mo deposits occur as porphyry, porphyry-skarn and skarn types, with Mo metal reserves of ~ 6 000 000 tonnes. Previous works have focused on their geological, geochemical and geochronological features, but characters of the ore-forming fluids are still open issues. In this contribution, we provide the first systematic constraints of the ore-forming fluids, and propose that high-salinity CO_2-rich fluids can be regarded as a criterion for distinguishing between porphyry deposits in continental collsion setting and magmatic arc setting.

Four types of fluid inclusions have been recognized in these deposits, namely pure carbonic inclusions, carbon dioxide–aqueous inclusions, aqueous inclusions and polyphase daughter mineral-bearing inclusions. Obtained homogenization temperatures are basically higher than 300°C, and salinities can reach up to 67.2 wt%NaCl. eqv. It seems that the porphyry-mineralizing fluids in the East Qinling-Dabie belt are typified by high temperature, high salinity and CO_2-rich.

Considering that porphyry systems in island arcs commonly contain early coexisting high-salinity brine and low salinity aqueous vapor [1, 2], with no appreciable CO_2, we speculate that hypothermal brine appears to be indicative of magmatic-derived fluids, whereas high abundance of CO_2 can be regarded as a criterion between magmatic fluids in continental collision setting and island arcs.

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Geochemistry and petrogenesis of volcanic rocks from the Sanlangpu Formation and the Dashigou Formation in Qinling Mountains, China

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We present a detailed geochemistry study, new age dating for The Sanlangpu Formation and the Dashigou Formation volcanic rocks form the Xixiang Group, which provides significant insights into the petrogenesis of the volcanic rocks. The Sanlangpu Formation volcanic rocks, consisting of basalt and rhyolite which can be considered as bimodal magma suite, lie uncomfortably with the Sunjiahe Formation. The Dashigou Formation volcanic rocks are composed of basalt, andesite and rhyolite, lie up comfortably with the Sanlangpu Formation. A combined field, geochronological, and geochemical study of the volcanic rocks is reported here. This study provides the first reliable LA-ICPMS zriron U-Pb dating for rhyolite sample collected form the Gangchang village in Nanzhen County gave a weighted mean $^{206}Pb/^{238}U$ age of 803.0±5.3Ma, which documented report of Neoproterozoic magmatism in Xixiang area. All the volcanic rocks belong to subalkali magma and erupted within plate. Trace element ratio partial melting composition model suggest basalts form the Sanlangpu Formation are derived from primary garnet lherzolite with a partial melting degree of 7%. According to the similarity of the trace element ratios and patterns, we also suggest an impossible source of the Baimianxia Formation basalts for rhyolites, and the rhyolite magma might undergone strong crystallization of plagioclase during its evolution. On the other hand, the basalt, andesite, and rhyolite in the Danshigou formation have the same trace element ratios, ε (t) and T_{DM}, suggesting a same parent magma. Basalts in Danshigou Formation are possible derived from primary garnet lherzolite with the partial melting degree of 10%, and andesite derived when the residual magma approach to 70% during crystallization, and rhyolites occurred when the residual magma approach from 20% to 30%. The basaltic parent magma underwent strong crystallization of plagioclase and Fe-Ti oxides. It is inferred that the Sanlangpu Formation and the Dashigou Formation volcanic rocks also be attributed to the products of Neoproterozoic continental berak-up in northern margin of the Yangze Plate.

This study was supported by the National Natural Science Foundation of China (Grant No. 40872061, 40772137 and 40972150).