1 Introduction

In the Qiushuwan copper-molybdenum ore district, the granite porphyry is shaped as stocks, about 300m long, 200m width from north to south, 0.06 km² exposed area, and its main body exposes in the central section. Magma intruded along the core of syncline structure, in NWW direction as “a long tongue”, which occurrence is consistent to the fracture structure. Magma intruded from southwest to northeast, and inserted into biotite schist, marble and interlayer gliding section, with the characteristics of penetrating and branching along the layer.

2 Petrology

Intrusive rock is grey-white fine-grained biotite granite with porphyritic texture, and matrix is cryptocrystalline microcrystalline texture and massive structure.

Phenocryst is about 15%, quartz is mainly phenocrysts and matrix with 2-3 mm size and 35%-45% content. Potassium feldspar as phenocrysts and groundmass is 3-5mm diameter and 25%-30% content. Biotite is 1-3mm diameter and 5%-8% content, also as phenocrysts and groundmass. In the contact part of magmatite and wall rock, many kinds of alterations are recognized, such as silicification, potassic, sericite greisenized, skarn, propylitization, molybdenite, pyritization and chalcopyrite.

3 Geochemistry

The loss on ignition of the main elements is low, less than 3%, and the content of SiO₂ is 77.15%-74.63%, characterized by the high silicon series. Based on the Q-A-P diagram, most of data projects in the area of monzonitic granite. The content of Al₂O₃ ranges from 13.18% to 14.69, indicating the low aluminum series. The Litman index is 1.91 to 3.09, belongs to the calc-alkaline series to alkaline series. The ratio of w(K₂O)/w(Na₂O) larger than 1, characterized by potassium rich series.

Trace elements that were normalized by primitive mantle, were enrich of Large ion lithophile elements (LILE), including Rb, Ba, Th and K, loss of high field strength elements (Ti, Nb).

REE chondrite normalized as a right distribution pattern, indicates that it exists the fractionation of the light and heavy rare earth elements but more obvious for the light rare earth elements just because of the high ratio of (La/Sm)ₙ. The low ratio of (Gd/Yb)ₙ suggests the indistinctive fractionation for the heavy rare earth elements. Qiushuwan granite is more enriched in LILE, ΣREE and LREE, with a weak negative Eu anomaly.

Using the granite diagram of Rb-Yb+Ta, the magmatic rock locates in the section of volcanic island arc environment. It is characterized by ratio less than 1 of Na₂O/K₂O, high abundance of Ba and Sr, high LREE, low Y, Yb, Ti and Nb, high ratio of Sr/Y and La/Yb, low Rb/Sr.

The Qiushuwan granite is similar to the Adakite in many geochemical characteristics, such as high SiO₂ and Sr, low Y and HREE, obscure Eu anomaly, loss of Nb.
And, the Adakite that derived from plate subduction or partial melting of the thickened crust has high content of Ba. But the following characteristics are obviously different with Adakite: (1) the average Al₂O₃ is 13.49%, but Adakite higher than 15%; (2) the average ratio of \( \frac{w(K_2O)}{w(Na_2O)} \) is 1.29, yet the range is 0.5-1.1 for Adakite; (4) in the diagram of K-Na-Ca, Adakite is trondhjemite trend which is different from the calc-alkaline evolution trend of Qishuwuan granite.

In the ore district, Qishuwuan granitic porphyry as the ore-forming parent rock has high content of Ba-Sr. In eastern China, the high Ba-Sr granite is usually considered to be the result of fractionation after the crust-mantle mixing. There is close relationship between the high Ba-Sr granite and Mafic magma.

## 4 Diagenesis Environment

It is controversial to the tectonic environment of the diagenesis and mineralization in the eastern Qinling molybdenum ore belt. Hu et al (1988) thought that it was formed in the extrusion background of interior continent, with the formation of I type and syntectic type rock by intracontinental subduction. Chen et al (2000) emphasized that it formed in the transition period from continent-continent collision to extrusion stretch, namely the remelting type or collision type for the metallogenetic rock body. Li et al (2005) pointed out that the local extension was dominant in the intracontinental orogenic environment after collision orogeny.

The high Ba-Sr of granite in Qishuwuan area suggests the crust-mantle mixing. Generally, the magma intrudes along the deep faults or the core of anticline emplacement, yet along the core of syncline in Qishuwuan, which shows the extensional environment just at that time, because it is in the core of syncline that the stress concentrated mostly. And, a small amount of deep source xenoliths are uniformly distributed in the rock as well as a large number of strip or angular wall rock xenoliths, also showing its passive emplacement. In the light of Rb-Yb+Ta diagram, Qishuwuan granite related to volcanic island arc rock which reflects the tension environment similarly. Research shows that in Qishuwuan area the geological background and dynamic mechanism of high Ba-Sr granite could be similar to north China and Dabie-Sulu orogenic belt.

During late Jurassic to early Cretaceous, the subduction of oceanic plates and the left-lateral strike-slip movement of the Tanlu fault destroyed the balance of mantle convection and lithosphere. Magma mixing both mantle-derived magmas and crust remelting magma contributed to the formation of typical syntexis type or I type granite, namely the ore-forming mother rock in the eastern Qinling molybdenum ore belt. Mao et al (2005) thought that although the eastern Qinling molybdenum ore belt formed in the transition period of compressional extensional tectonic environment, actually it was controlled by the extensional tectonic stress field.

The initial magma of Qishuwuan granitic porphyry was the mantle-derived magma in the extensional tectonic stress background, whose intrusion brought about tremendous heat. Stretching process also makes the crust decompression melting. All of these contributed to the Qishuwuan granitic porphyry.

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## References


