West Junggar Hal hudag rock mass geology, geochemistry and geochronology research

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Preface

West Junggar region is located at the junction of the Kazakhstan plate and Tarim plate and Siberia plate area, the fault development and granitic intrusive body widely distributed. Predecessors' studies of granite rock mass in west junggar are mainly concentrated in Midwest and SaWuEr region, similar research in mountain Xiemisitai is relatively weak. Hal hudag rock mass is located in the northern west junggar, middle mountain Xie misitai F.1), Prof. Juli Wang newly first discovered big scale and high strength copper mineralization in volcanic rocks and volcanic rocks of Hal hudag, the information of intrusive rock and extrusive rock and their relationship between the copper mineralization in the area still need further research; Therefore, we conduct systematical study of geology, geochemistry and geochronology of rock mass in this area. We aim to find out the main rock types, their formation time, tectonic environment and explore mountain Xiemisitai tectonic-magmatic activity and its relationship with mineralization.

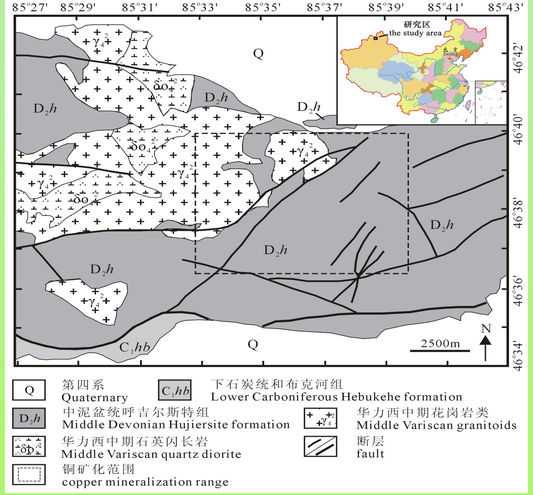


Figure.1 Geological map of Xiemisitai

The main work has been completed

1. Field Work

The right geologic map F.2 shows the shape of the rock mass and relationship with neighbor geologic settings. We collect the rock sample along the white line.

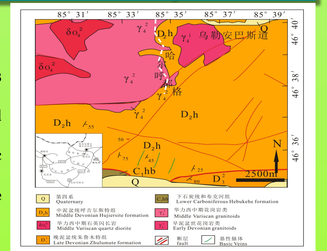


Figure.2 Geological map of Hal hudag

2. Petrography

Predecessors determined the exposed rock as Biotite Hornblende Granite, through petrographic study, we found that the main rock outcropped are Moyite (F.3) and Granodiorite (F.4).

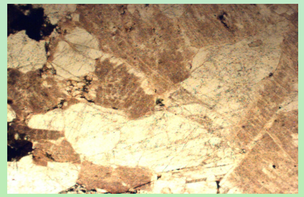


Figure.3 Moyite

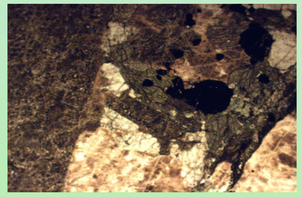


Figure.4 Granodiorite

3. Geochemistry

(1) Major elements

Moyite

high silicon (SiO277.05 % ~ 77.51%), high alkali, high sodium, content of TiO2, TFe2O3, MnO, MgO , CaO, P2O5 is low; Terman index in sigma = 1.87 ~ 1.97, for the calc-alkaline series, points in the SiO2 - K2O figure indicates they belong to high-K calc-alkaline series area (F.5a); A/CNK = 0.99 ~ 1.03, A/NK = 1.05 ~ 1.07, A/CNK-A/NK figure indicates they belong to quasi aluminum - weakly peraluminous area(F.5b).

Granodiorite

SiO2 (63.01% ~ 66.74%), content of TiO2, TFe2O3, MnO, MgO, CaO, P2O5 is relatively higher than the moyite; Terman index in sigma = 2.34 ~ 3.45, most of samples belong to calcium alkali series, SiO2 - K2O figure indicates all of them belong to high-K calc-alkaline series, individual samples make the transition to shoshonite series(F.5a); A/CNK = 0.84 ~ 0.98, A/NK = 1.36 ~ 1.58, A/CNK - A/NK figure indicates them belong to quasi-aluminous area(F.5b).

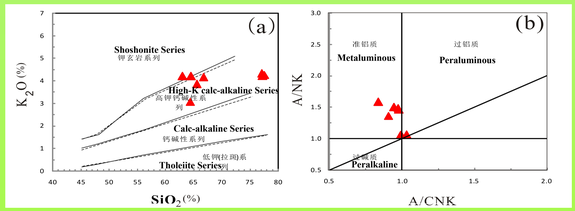


Figure.5 SiO2-K2O diagram(a) and A/CNK-A/NK diagram(b)

(2) Rare Earth Elements

Moyite

samples have higher total rare earth(∑ REE = 286.01 x 10-6-500.52 x 10-6)and the lower fractionation of light and heavy rare earth elements (LREE/HREE = 0.85 ~ 1.28, (La/Yb) N = 2.44 ~ 3.53), the light rare earth elements' internal degree of fractionation is higher than that of heavy rare earth elements(LaN/SmN = 5.01 ~ 5.67, the GdN/YbN = 0.48 ~ 0.71). A strong Eu negative anomaly, chondrite-normalized REE patterns indicates a steep "V"-shaped curve (F.6a), with characteristics of A-type granites.

Granodiorite

samples have lower total rare earth (∑ REE = 96.04 x 10-6-118.55 x 10 -6) , high degree fractionation of light and heavy rare earth elements(LREE/HREE = 2.93 ~ 3.35, (La/Yb) N = 11.16 ~ 13.15),light rare earth elements' internal fractionating degree is higher than that of heavy rare earths elements(LaN/SmN = 5.93 ~ 5.93, the GdN/YbN = 1.55 ~ 1.77). Slightly Eu negative anomaly, chondrite-normalized REE patterns indicates a LREE enrichment right-incline type (F.6a).

(3) Trace elements

Moyite enriched in Rb, Th, U, Pb, Zr, Hf ,etc, strongly depleted in Ba, Nb, Ta, Sr, P, Ti, etc. (F6.b).

Granodiorite enriched in Rb, Th, K, Pb, Sr, Zr, Hf, etc, strongly depleted in Ba, U, Nb, Ta, P and Ti, etc. (F6.b).

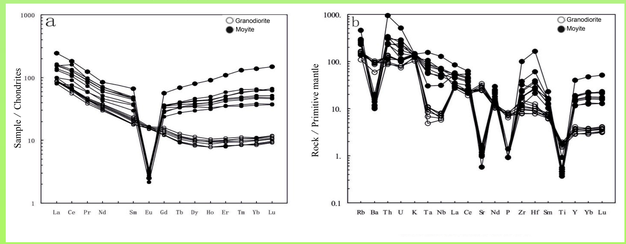
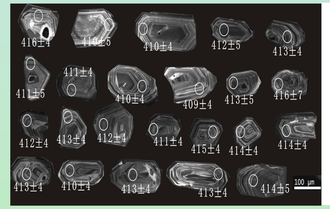


Figure.6 Chondrite-normalized REE distribution patterns diagrams(a) and primitive mantle-normalized trace element spider diagram (b)

4. Geochronology

Predecessors determined the formation age of rock mass was γ_4^{2c}. Our the zircon dating of Granodiorite is 411.7±1.7 Ma (F.7), which indicates its formation age is during the Early Devonian. The zircon dating of Moyite is 422.7±2.0 Ma (F.8), which indicates its formation age is during the Late Silurian.



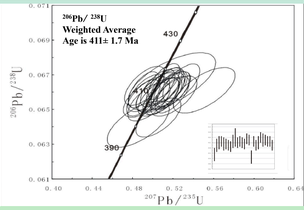
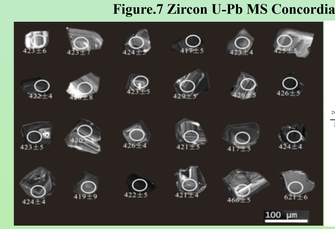


Figure.7 Zircon U-Pb MS Concordia diagram of Granodiorite



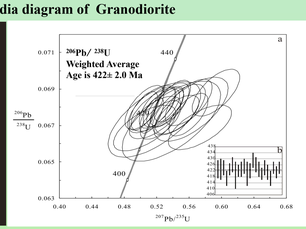


Figure.8 Zircon U-Pb MS Concordia diagram of Moyite

Conclusion

1. Rock Type

The Hal Hudag made up by Moyite and Granodiorite. According to Zr-SiO2 figure (F.9), the Moyite is A-type granite and the Granodiorite is I-type granite.

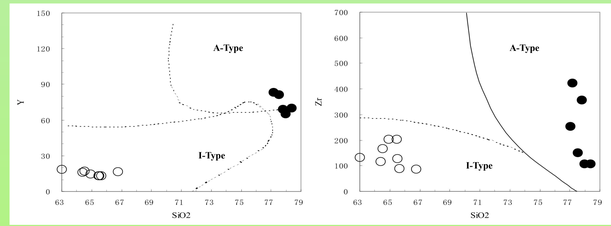


Figure.9 A and I type Granite Zr-SiO2 diagram

2.Geochronology

The formation age of Moyite is 422.7±2.0 Ma and the Granodiorite is 411.7±1.7 Ma. The geochronology information indicates that Hal Hudag's formation age is Late Silurian to Early Devonian.

3. Relationship with the Mineralization

Granodiorite and Moyite come from same or similar magma source. geochronology information indicates that they are the products from same geologic magma movement, which leads the enrichment of Copper element

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