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Olivine Chemistry and Sulfur Isotopes of the Newly-discovered Xiarihamu Magmatic Ni-Cu Sulfide Ore Deposit in the Eastern Kunlunorogenic Belt, Qinghai-Tibet Plateau

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The Xiarihamu magmatic sulfide deposit was discovered in 2011 (Li et al., 2012). A drilling campaign to date has delineated a total resource of >100 million tons of ores with the average grades of 0.6 wt.% Ni and 0.1 wt.% Cu. The deposit is hosted in a mafic-ultramafic complex formed by protracted basaltic magmatism in the Eastern Kunlun orogenic belt in the northern part of the Qinghai-Tibet Plateau (Fig. 1). The Xiarihamu mafic-ultramafic complex consists of a gabbroic body with zircon U-Pb age of ~439 Ma(Jiang et al., 2014) and a ultramafic body that intruded the central and southwestern parts of the gabbroic body. Small late gabbrodiorite dykes with zircon U-Pb ages of ~382-393 Ma (Li et al., 2012) are present in places within the complex. Granitoids with

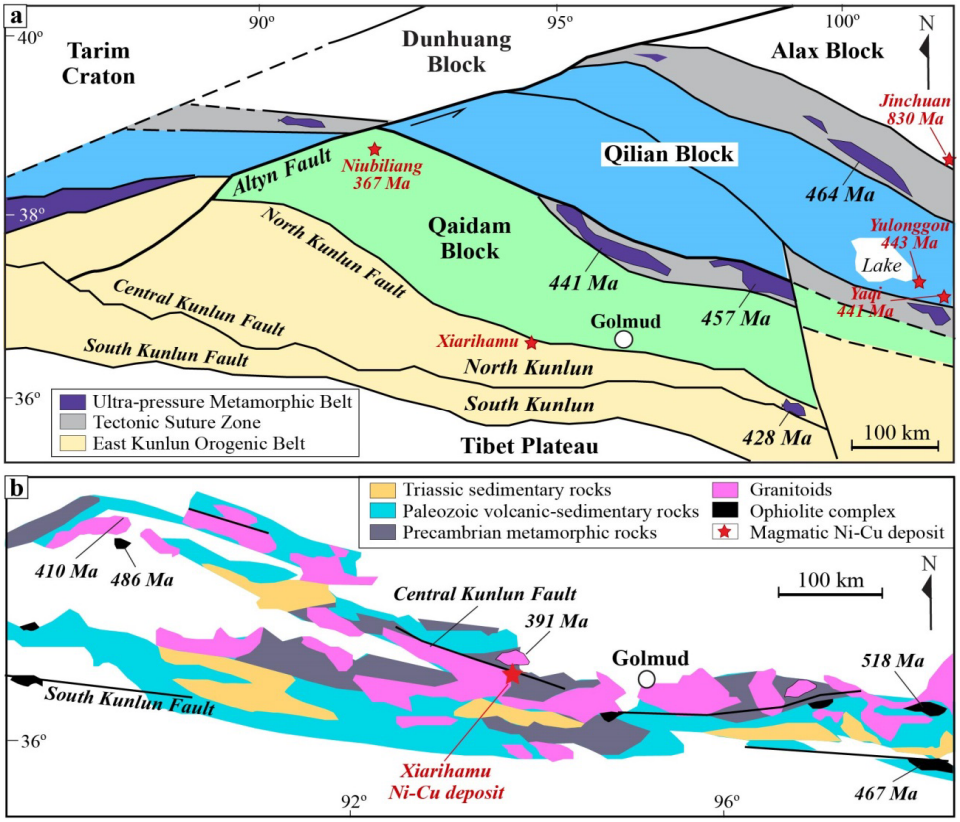

Fig. 1. Tectonic units of Qilian-Qaidam-Kunlun region(a) and regional geological map showing the location of Xiarihamu Ni-Cu deposit(b)

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zircon U-Pb ages of ~391 Ma (Wang et al., 2013) are abundant in the region including the vicinity of the complex(Fig. 1).

Websterite, olivine websterite and lherzolite are the major rock types of the Xiarihamu ultramafic intrusion. Lherzolite containing up to 10% plagioclase is also present in a few places. The whole rock samples from the intrusion are characterized by light REE enrichments relative to heavy REE and by pronounced negative Nb-Ta anomalies. Olivine crystals are all depleted in Ca (<1000 ppm). Their Fo contents vary from 84 to 90 mole %. The whole-rock data and olivine Ca compositions are consistent with ultramafic rocks formed in an arc setting.

There are two types of olivine in the sulfide-poor samples. Both of them show positive Fo-Ni correlation which is characteristic of fractional crystallization. These two types of olivine have similar range of Fo contents (Fo84-87.6) but significantly different Ni contents: one with Ni contents up to 3500 ppm whereas the other type with Ni contents up to 2400 ppm. The difference mainly reflects the different Ni contents in their parental magmas.A plausible explanation is that the low-Ni magma experienced sulfide segregation whereas the high-Ni magma did not. Our results show that at least two distinct types of magma were involved in the formation of the Xiarihamu ultramafic intrusion.

Economically valuable sulfide mineralization is associated with all rock types in the Xiarihamu ultramafic intrusion. Disseminated, semi-massive and massive sulfide ores are the major ore types. The sulfide ores are mainly composed of pyrrhotite, pentlandite and chalcopyrite. The ^{34}S values of the sulfides ores are elevated, varying from 3.5 to 6.8 per mil (mean = 5.6 per mil, n = 23). Immediate gneisses and marble country rocks are generally poor, but hydrothermal base metal (Cu, Pb and Zn) mineralization is common is the area. We propose that the elevated ^{34}S values of the Xiarihamu sulfides ores are due to addition of external sulfur, possibly from the pre-existing hydrothermal base metal sulfides at depth.

References

Jiang, C Y, Ling, J L, Zhou, W, Wang Z X, Du, W, Fan, Y Z, Song, Y F, 2014.Petrogenesis of the Xiarihamu Layered Mafic-ultramafic Intrusion, East Kunlun: Implications for Its Extensional Island Arc Environment:ActaPetrologicaSinica (in press). In Chinese with English abstract.

Li, S J, Sun, F Y, Gao, Y W, Zhao, J W, Li, L S, Yang, Q A, 2012. The Theoretical Guidance and the Practice of Small Intrusions Forming Large Deposits-The Enlightenment and Significance for Searching Breakthrough of Cu-Ni sulfide Deposit in Xiarihamu, East Kun lun, Qinghai: Northwestern Geology 45:185-191. In Chinese with English abstract.

Wang, G, Sun, F-Y, Li, B., Li, S-J, Zhao, J-W, Yang, Q-A, Ao, C, 2013.Zircon U-Pb Geochronology and Geochemistry of the Early Devonian Syenogranite in the Xiarihamu Ore District from East Kunlun, with Implications for the Geodynamic Setting: Geotectonica et Metallogenia 139: 685-697.In Chinese with English abstract.