1 Introduction

In recent years, a number of large banded magnetite deposits have been found in the Taxkorgan area of the Western Kunlun orogenic belt, including the Zankan, Laobing, Mokaer, Yelike and Jiertieke deposits (Fig. 1). The iron orebodies mainly occur in Paleoproterozoic Bulunkuole Group, which consist of magnetite quartzite, plagioclase hornblende gneiss, biotite quartz schist and marble. The Zankan iron deposit is the largest deposits discovered until now. The geological characteristics and genesis of the deposit were poorly understood prior to the present study.

2 Geological Setting

The Zankan iron deposit contains proven reserves of about 500 Mt Fe at an average grade of 28–32 wt.% Fe. The strata widely exposed enclosing the deposit are metamorphic rocks of Paleoproterozoic Bulunkuole Group. In the mining area, the folded host metasedimentary sequence is accompanied by intermediate acid intrusive rocks.

As of 2014, a total of 7 orebodies have been discovered in the deposit; Nos. I and III are the main orebodies. They occur in hornblende plagioclase schist and biotite quartz schist, and locally in the contact zone of felsite and biotite quartz schist (Fig. 2). The No.I orebody (6200 m long and 29 m thick) is located in the northern part of the mining area, and mainly occurs in the inner hornblende plagioclase rocks. The No.III orebody (720 m long, and 32 m thick) is located in the central part of the mining area, occurs in the contact zone of felsite and biotite quartz schist. It has an average grade of 32.19 wt.% Fe.

The main ore minerals are magnetite, hematite, pyrrhotite, chalcopyrite; the main gangue minerals are quartz, chlorite, pyrite, tremolite, diopside, apatite, calcite, hornblende, biotite and anhydrite. The iron ore structures mainly include banded structure, disseminated structure, and massive structure. The ore texture includes anhedral granular texture, euhedral-subhedral granular texture, metasomatic pseudomorphic texture, and remnant texture.
3 Mineralogical Characteristics

Based on geology and mineralogy, the iron deposit is interpreted to have been formed through three metallogenic stages: an early sedimentary stage, a metamorphic stage and a latest magmatic hydrothermal stage. In the magmatic hydrothermal stage, the ore-forming process can be further divided into a skarn sub-stage, a hydrothermal replacement sub-stage and sulfide sub-stage. The Fine anhedral magnetite from the early sedimentary stage mainly occur surrounding quartz grains in banded ores. This type of magnetite has low TFeO (88.43 wt% ~ 90.55 wt%), MgO (0 ~ 0.01 wt%), MnO (0.12 wt% ~ 0.20 wt%), and high TiO2 (0 ~ 0.06 wt%), Al2O3 (0.30 wt% ~ 0.39 wt%).

Magnetite formed in the middle metamorphic stage have allotriomorphic granular blastic textures in banded ores, with higher TFeO (92.09 wt% ~ 92.92 wt%), MgO (0.02 wt% ~ 0.05 wt%), MnO (0.35 wt% ~ 0.43 wt%) and lower TiO2 (0 ~ 0.01 wt%), Al2O3 (0.09 wt% ~ 0.13 wt%). Magnetite attributable to the skarn sub-stage (late magmatic hydrothermal stage) have euhedral granular structure and are enriched in TFeO (91.57 wt% ~ 91.91 wt%), MgO (0 ~ 0.04 wt%), MnO (0.35 wt% ~ 0.36 wt%), but poor in TiO2 (< 0.01 wt%), Al2O3 (0.05 wt% ~ 0.07 wt%). Magnetite with mainly euhedral -hypidiomorphic granular texture and replacement remnant texture of hydrothermal alteration sub-stage are mainly distributed in disseminated ores. These display a large compositional range TFeO (90.75 wt% ~ 92.64 wt%), Al2O3 (0.06 wt% ~ 0.27 wt%), TiO2 (< 0.01 wt%), MnO (0.25 wt% ~ 0.42 wt%) in this type of magnetite. In the ternary plot of TiO2-Al2O3-(MgO + MnO) of magnetite (Fig. 3), the early stage magnetites tend to be seated in the contact metasomatic and sedimentary metamorphic area, and others tend to be seated in the skarn zone.

4 Genesis

Using current geochronological research result for reference, the early sedimentary stage magnetite was formed in the marine environment in Palaeoproterozoic. After that, it suffered from the regional metamorphism between New Proterozoic and Late Paleozoic, the metamorphism of some early sedimentary stage magnetite to form the middle stage magnetite. From Late Mesozoic to Cenozoic, large-scale acidic magmatism has erupt in the area. The skarn sub-stage magnetite (late magmatic hydrothermal stage) was formed in the contact zone of felsite and biotite quartz schist. As magma hydrothermal further migration to the metamorphic rocks, the recrystallization of the sedimentary and metamorphic stage magnetite to form the hydrothermal replacement sub-stage magnetite. In conclusion, the genesis of the iron deposits is attributed to sedimentary metamorphic iron deposit, and suffered by post magmatic hydrothermal metasomatic alteration.

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