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Alteration and Mineralization Paragenesis of the Bailingshan Fe (-Cu) Deposit in Eastern Tianshan

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The Eastern Tianshan, located between the Turfan-Hami (Tu-Ha) basin and the central Tianshan belt, is a part of the Tianshan Orogenic Belt (TOB) and can be subdivided into several subunits by nearly EW-trending deep faults (Hou et al., 2014). It's composed of Dananhu-Tousuquan arc belt, the Kanggur shear zone and the Aqishan-Yamansu volcanic belt from north to south. The Aqishan-Yamansu volcanic belt is bounded by the Yamansu fault to the north and by the Aqikeduke fault to the south, respectively. Numerous Fe (-Cu) deposits in this belt have been discovered, such as Aqishan, Hongyuntan, Bailingshan, Yamansu, and Shaquanzi from west to east (Mao et al., 2005).

Among these deposits, the Bailingshan Fe deposit contains a reserve of 13.065 Mt iron with average grade of 44.94%. The orebodies are hosted in the andesitic tuff breccia of the Matoutan Formation consisting of the Late Carboniferous dacite tuff, andesitic tuff breccia, andesitic to dacitic tufflava and andesitic tuff-andesitic tuff breccia from the bottom up (Wang et al., 2005). Many granitoids, such as the granodiorite, moyite and granite porphyry, intruded the above layer.

Ore minerals at Bailingshan are dominated by magnetite, hematite, pyrite, chalcopyrite, and specularite, with garnet, clinopyroxene, amphibole, epidote, chlorite, quartz, and calcite as the dominated gangue minerals. The ore textures are mainly massive and disseminated. Based on the handspecimen and petrographic observation, seven stages of alteration and mineralization are identified at Bailingshan. It contains the early skarn stage, late skarn stage, main mineralization stage, late amphibole stage, quartz-sulfide stage, late veins stage and oxidation stage (Fig. 1). The earliest stage I (early skarn stage) comprises aggregates of coarse-grained garnet and fine-grained clinopyroxene. In the subsequent stage II, metasomatism occurred throughout the garnet and clinopyroxene, represented by amphibole and minor pyrite. Stage III, main mineralization stage, which formed the massive iron orebodies, comprises a variety of opaque and gangue minerals. Major mineral assemblages assigned to stage III are magnetite-epidote and magnetite-chlorite (±epidote). In stage IV and V, minor amphibole (different from those in stage II) and intense quartz-sulfide veins cut the stage III magnetite-epidote assemblages (Chen et al., 2010; Chen et al., 2011; Duan et al., 2013). Meanwhile, massive quartz-pyrite aggregates, sometimes with chalcopyrite, have void filling with magnetite. In stage VI, numerous late veins, such as quartz (without sulfide), hematite, specularite, and calcite-barite, cut the magnetite-epidote or quartz-sulfide assemblages. Oxidation (stage VII) commonly developed on magnetite and sometimes on the surface of chalcopyrite to form bornite and azurite.

The characteristics based on the field and petrographic studies imply that the Bailingshan Fe deposit is a metasomatic deposit in the Eastern Tianshan belt.

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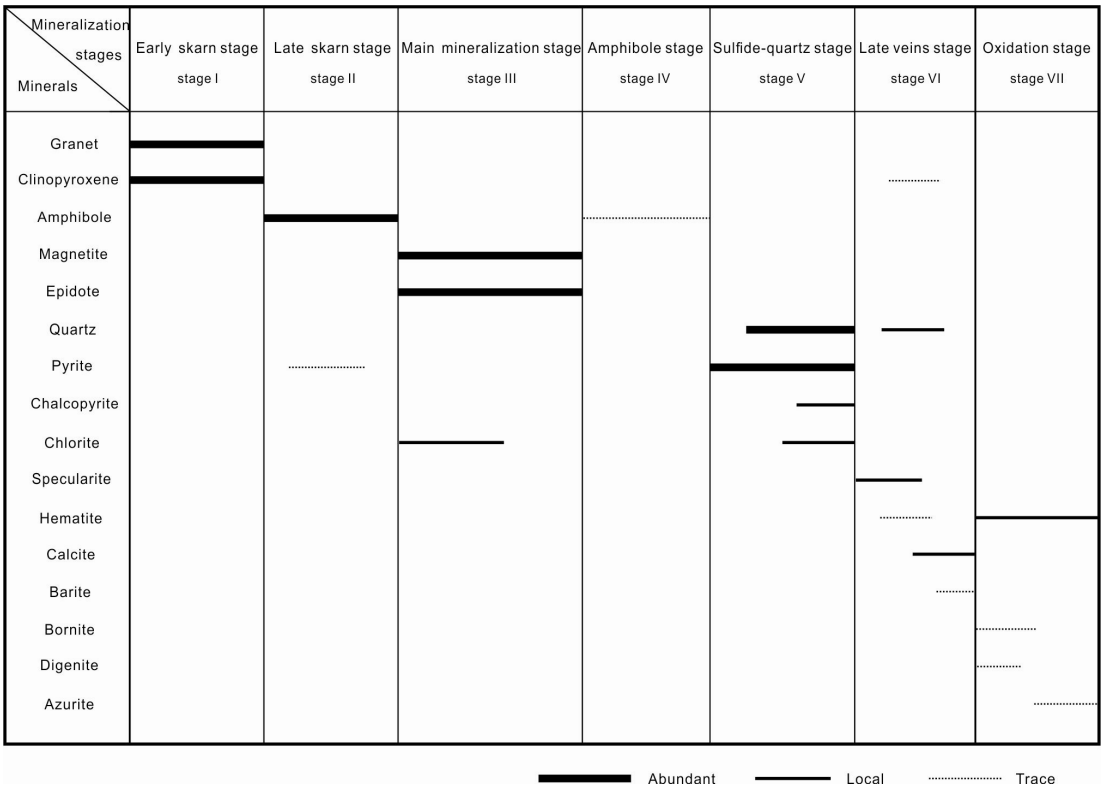

Fig. 1. Alteration and mineral paragenesis of the Bailingshan Fe deposit.

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