



Two-phase Mineralization of Newly-discovered Xiaohongshilazi Pb-Zn-(Ag) Deposit: Evidence from Geological Characteristics, Zircon U-Pb and Metal Sulfide Rb-Sr Geochronology

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Abstract: The Xiaohongshilazi deposit is a newly-discovered, medium-scale and unique Pb-Zn-(Ag) deposit in central Jilin Province, and is located at the junction between the eastern segments of the northern margin of the North China Block and Central Asian Orogenic Belt (CAOB). Mineralization characteristics and geochronological data indicate that the region was the site of volcanic-associated massive sulfide Pb-Zn mineralization that produced stratiform orebodies within Daheshen Formation marine volcanic rocks, followed by vein-type Pb-Zn-(Ag) mineralization in granodiorite porphyry. The

stratiform Pb-Zn polymetallic mineralization interbedding with the marine volcanic rocks of the Daheshen Formation (Fig. 1a) was controlled by the pre-mineralization E-W-trending faults. Vein-type Pb-Zn-(Ag) mineralization occurs within or parallels to the granodiorite and diorite porphyries, and controlled by the major-mineralization N-S-trending faults that cut the stratiform mineralization and volcanic rocks (Fig. 1b, c, d; Chang, 2016; Li, 2017). Stratiform Pb-Zn ore displays banded and massive structures, and comprises dominantly pyrrhotite, galena, sphalerite, pyrite, and minor chalcopyrite. Wall-rock alteration

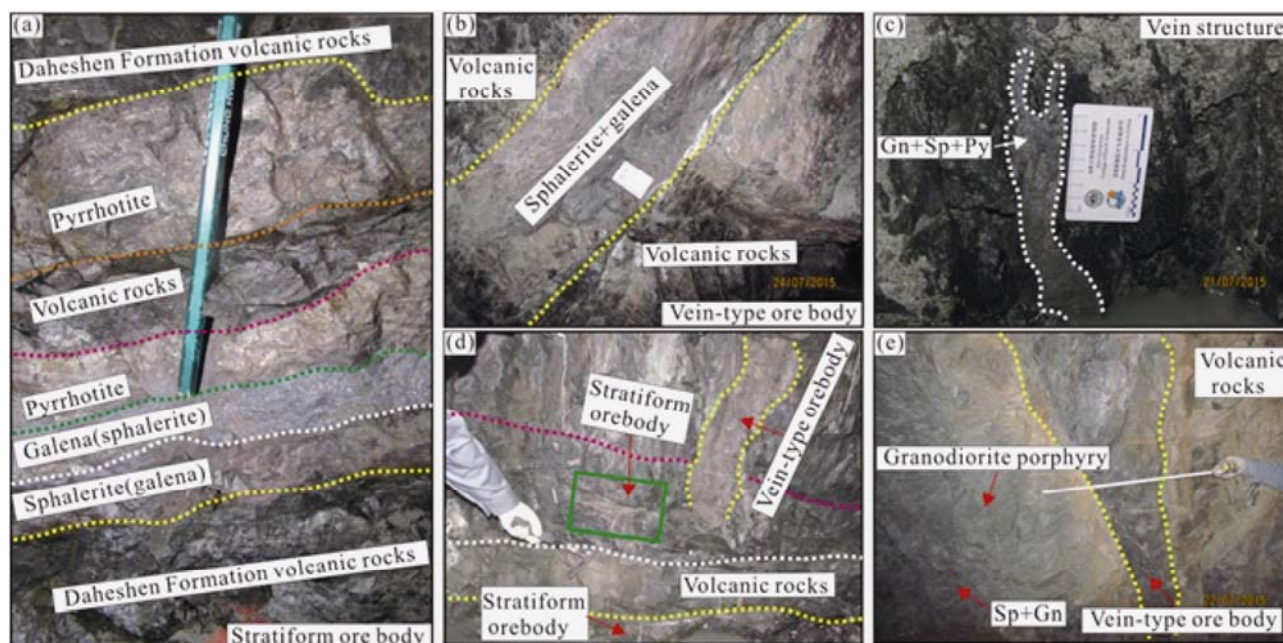


Fig. 1. Representative photographs showing mineralization characteristics of the stratiform- and vein-type orebodies and their spatial-cross-cutting relationships in the Xiaohongshilazi Pb-Zn-(Ag) deposit.

(a) Stratiform Pb-Zn ore bodies displaying a banded structure and interbedding with the marine volcanic rocks of the Daheshen Formation. (b) Vein-type Pb-Zn (Ag) ore bodies cut the volcanic rocks of the Daheshen Formation. (c) Vein-type Pb-Zn (Ag) ore bodies occur along fissures and fractures. (d) Vein-type Pb-Zn (Ag) ore bodies cut the stratiform ore bodies and the volcanic rocks. (e) Vein-type Pb-Zn-(Ag) ore bodies develop around the granodiorite porphyry, and both of them occur along fissures and fractures and cut the volcanic rocks of the Daheshen Formation. Abbreviations: Py = pyrite; Sp = sphalerite; Gn = galena.

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related to stratiform mineralization includes chloritization, epidotization, and sericitization. The vein-type mineralization along fractures and fissures mainly occurs at the edge of granodiorite porphyry. Vein-type ore occurs mainly within vein, stockwork, and disseminated structures. Major metallic minerals include galena, sphalerite, and pyrite, as well as silver existing in galena and sphalerite by the form of isomorphism. Alteration accompanied vein-type Pb-Zn-(Ag) mineralization and includes silicification, chloritization, epidotization, carbonatization, and minor sericitization. Alteration assemblages are well-developed within and along the margins of the granodiorite porphyry (Fig. 1e), indicating that Pb-Zn-(Ag) mineralization is temporally and spatially related to the granodiorite porphyry. This is also supported by the isotope chronological evidences in our study that the granodiorite porphyry yields the zircon U-Pb age of 203.6 ± 1.8 Ma (MSWD=1.8), which is consistent with Rb-Sr isochron age (195 ± 17 Ma; MSWD=4.0) of four metal sulfide samples from vein-type Pb-Zn ore. This indicates that vein-type Pb-Zn-(Ag) mineralization and associated granodiorite porphyry were formed during the late Triassic-early Jurassic. By combining the new age data for the Xiaohongshilazi Pb-Zn-(Ag) deposit with our current understanding of the regional tectonic history (Xu et al., 2013), we infer that stratiform VMS Pb-Zn mineralization in the Xiaohongshilazi deposit formed during eruption of the Daheshen Formation marine volcanic rocks on the seafloor in an extensional back-arc basin that formed in response to Paleo-Asian oceanic plate subduction (Yu et al., 2014). The vein-type Pb-Zn-(Ag) mineralization occurred in the late Triassic-early Jurassic due to the initial subduction of Paleo-Pacific Plate. In addition, this paper reports two new mineralization events in central Jilin Province, which may provide a new direction for the further ore prospecting in the area. Late Carboniferous-Early Permian marine volcanic rocks in the region are significant prospecting indicators for the VMS Cu-Pb-Zn mineralization.

Key words: LA-ICP-MS zircon U-Pb dating, Metal sulfide Rb-Sr dating, Xiaohongshilazi Pb-Zn-(Ag) deposit, Central Jilin Province, NE China

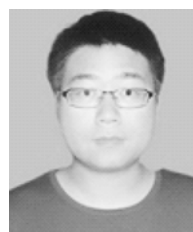
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