Tectonic Magmatic Evolution and Mineralization of Bogda-Harlik Tectonic Belt, Xinjiang, China

Zhixin Zhu,* Ping Li, Tongyang Zhao, Liuyuan Jin, and Yanfei Zhu

Geology Survey Institute of Xinjiang, Urumqi, China, *e-mail, zhuzhixin8888@163.com

The Bogda-Harlik Tectonic Belt, as an important part of Central Asian Orogenic Belt (CAOB), was widely concerned. Its tectonic setting was thought to be Harlik composite island arc and Bogda late Paleozoic back-arc rift basin by most researchers. A large amount of data on regional geological mapping and mineral deposits were accumulated in recent years. Coupled with the latest research results, this study integrated regional geological setting, geological characteristics, model of typical deposits, and regional metallogeny and summarized the tectono-magmatic evolution and mineralization of Bogda-Harlik tectonic belt. Tectono-magmatic evolution and mineralization in the belt and adjacent areas can be subdivided into three major stages (I, II, and III). Stage I: Island arc evolution and mineralization from middle Ordovician to late Silurian. The Harlik-Dananhu immature island arc, characterized by the lack of ancient basement, was generated by the northward subduction of the Kangur oceanic basin beneath the Junggar block. A large number of mineral deposits were formed during the development of Harlik-Dananhu island arc, such as the Honghai VMS copper-zinc deposit, Hongshan epithermal copper-gold deposit, Hongshi-Meiling epithermal copper deposit, and Yudai porphyry copper-molybdenum deposit in the Kalatage area. The above mineral deposits are all hosted within in late Ordovician (442.6 ± 5.3 Ma) volcano-sedimentary rocks. Stage II: Island arc evolution and mineralization from Devonian to early Carboniferous. The Tuha basin was located between Harlik and Dannanhu island arcs as a residual ocean basin until the end of the orogeny (Xiao et al., 2004). At the end of early Carboniferous, the Kangur ocean basin eventually disappeared and closed with the continuous subduction. The terranes composed of various tectonic units were formed during collision and collage. These processes led to Harlik island arc extremely complicated and magma activity in the arc was strongly associated with late Paleozoic orogeny. Although no large mineral deposits were discovered yet, there is potential to find porphyry style of mineralization. During the Harlik back arc extension, a small volume of rifting and bimodal volcanic rocks were formed in Qijiaojing area of the Bogda volcano-sedimentary basin, which is located at the rear of Harlik island arc. Stage III: Post-collision evolution and mineralization from late Carboniferous to Permian. The gradual transformation of regional tectonic stress from compression to extension resulted in the mantle magma upwelling and underplating, generating magmas that show close association with copper deposits in the Bogda area (e.g., Tonggou epithermal copper deposit). Simultaneously, post-orogenic extensional deformation resulted in the formation of large extensional, tension-shear, and subordinate faults, which provided favorable space for the formation of epithermal gold deposits, such as the Suoerbasitao gold deposit. The Koumenzi ductile shear zones which extend several tens of kilometers were widely developed in Harlik island arc. It resulted in the reactivation and enrichment of gold and formed a series of ductile shearing style of gold deposits such as the Qiongzuerkai and Qiongzuerkaidong gold deposits.