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Geology, Geochronology and Geochemistry of the Noion-Tologoi Ag-Pb-Zn Deposit in the Mongol-Okhotsk Belt, Eastern Transbaikalia, Russia

HUANG Zetao[1, 2], LIANG Xinquan[1 *], SONG Tianjiao[1, 2], WANG Ce[3] and XIE Hao[1, 2]

[1] *Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, Guangdong, China*
[2] *University of Chinese Academy of Sciences, Beijing 100049, China*
[3] *Sun Yat-sen University, School of Marine Sciences, Zhuhai 519082, Guangdong, China*

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Abstract: Tectonically, the Mongol-Okhotsk Belt (MOB) is thought to be the eastern segment of the Central Asian Orogenic Belt (CAOB), which is located between the Siberian craton and the Northeastern China（Sengör et al., 1993; Windley et al., 2007; Xiao et al., 2004). The Noion-Tologoi polymetallic deposit is one of the super-large Ag-Pb-Zn deposits in the Mongol-Okhotsk Belt of Eastern Transbaikalia region, which is situated 146 km north of Manzhouli (China) and 315 km southeast of Chita (Russia). The deposit corresponds to the Akatui type of polymetallic deposits of eastern Transbaikalia, which are associated with volcanoplutonic rocks of the Akatui complex. The mining strata is comprised of the Bolboyskaya (J_3), Kaylasskaya (J_{2-3}), and upper Verkhnegazi (J_2) formations, as well as volcanic rocks or pyroclastic sedimentary rocks (J_{2-3}). The main fault structures in deposit are of NNE- and NWW-strike, both which are major ore-bearing structures. The orebodies are tabular, stockwork- and vein-like. The ores contain, on the average, 2.17% Pb, 3.25% Zn, and 95.86 μg/g Ag. The most common ore minerals are pyrite, galena, sphalerite, chalcopyrite, antimonite and arsenopyrite.

From previous studies, the deposit is closely related to the intrusions of the Akatui complex in temporally, spatially and genetically. The zircon LA-ICP MS U-Pb dating of syenite porphyry indicates that Mesozoic magmatic activity in the deposit emplaced at ~158–160 Ma. The Ar-Ar amphibole age of these rocks of 160–155 Ma is 154 ± 4.4 Ma (Sasim et al., 2016). The Ar-Ar amphibole age of the effusive rocks of the Kailas Formation (J_{2-3}) of the Akatui deposit is 161 ± 1.7 Ma, which evidences that they formed nearly at the same time as the above syenite porphyry or tuff (Abramov, 2017). The similar geologic structures of the intrusive and effusive rocks of the coeval Akatui and Noion-Tologoi deposits indicate that the deposits formed in similar conditions.

The Jurassic volcanoplutonic rocks are characterized by high K(K_2O: 4.12%–5.16%, K_2O/Na_2O: 0.86–1.56) and Sr/Y (12.3~99.5), low Y(6.9 μg/g–20.3μg/g) and HREE(eg. Yb: 0.53μg/g–2.14μg/g), strongly fractionated REE patterns with (La/Yb)n=5.8–31.4 and evolved Sr-Nd isotopic compositions ($(^{87}Sr/^{86}Sr)_{160Ma}$ =0.7107–0.7121, ε_{Nd}(160 Ma)=-11.2–5.62) (Abramov, 2017). On the Sr/Y-Y and (La/Yb)n-Ybn diagrams, the studied most of volcanoplutonic rocks correspond to adakites. Some of the petrochemical and geochemical parameters of the studied intrusive and effusive rocks differ from those of adakites. Adakites result from the melting of subducted oceanic lithosphere and the delamination of continental crust in arc settings (Efremov, 2010; Martin, 1999).

The most likely sources of polymetallic ores of the Noion-Tologoi deposit were adakite-like magmas with a significant amount of remelted crustal material. Formation of adakites is often accompany by commercial mineralization of chalcophile elements.

Key words: Mongol-Okhotsk Belt, the Noion-Tologoi polymetallic deposit, deposit geology, Zircon U-Pb geochronology, major and trace geochemistry

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* Corresponding author. E-mail: liangxq@gig.ac.cn

About the first author

Huang Zetao, male, born in 1994, master, graduated from Guangzhou Institute of Geochemistry, Chinese Academy of Sciences. He is now interested in the study on ore deposit geochemistry. Email: Huangzt_go@163.com; phone: 1313855 8266.

About the corresponding author

Liang Xinquan, male, born in 1964, doctor, graduated from Guangzhou Institute of Geochemistry, Chinese Academy of Sciences. He is now interested in the study on geotectonics and its dynamic mechanism. Email: liangxq@gig.ac.cn; phone: 85290113.