Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9041

Geochronology and Petrogenesis of the Bronze Fox Porphyry Cu-Au Deposit: Implications for Geodynamic Evolution of the Gurvansaykhan Island Arc, Southern Mongolia

GANBAT BAYARAA[1,2], ODGEREL DASHDORJGOCHOO[1], XIAOYONG YANG[2], SANCHIR DORJGOCHOO[1,3], MOHAMED FAISAL[4], MUNKHTUR ENKHTUR[5] AND TUNGALAG NAIDANSUREN[6]

[1]Institute of Geology, Mongolian Academy of Sciences
[2]University of Science and Technology of China
[3]Institute of Geology and Geophysics, Chinese Academy of Sciences
[4]Suez Canal University
[5]Oyu-Tolgoi LLC
[6]Institute of Geology, Mongolian Academy of Sciences .
Presenting Author: ganbat.igmr.mas@gmail.com

Carboniferous volcanic arcs and granitoid intrusions are exposed in the Gurvansaykhan arc terrane, Southern Mongolia. Some important issues regarding the age, petrogenesis, and magmatic-hydrothermal evolution of the Bronze Fox magmatic rocks remain controversial. In this study, we present new field observations, petrographic, geochemical and geochronological data to describe magmatic evolution and geodynamic settings. In addition, the mineral chemistry data are reported from some selected rock-forming minerals in order to identify the crystallization condition of the studied rock units by employing the geothermobarometric methods. Zircon U-Pb age dating reveals that the volcanic lava was emplaced at 331 Ma, followed by mineralized intrusions which were intruded at about 326 Ma, respectively. The studied intrusive and extrusive rocks are characterized by high $Mg^{\#}$, high-K-alkaline, and metalimnions. They are enriched in large ion lithophile elements (LILE: Sr and Ba) and light rare earth elements (LREEs) and depleted in high field strength elements (HFSEs: Nb, Ta, and Ti). The highly mineralized granodiorite intrusion yields zircon crystallization temperatures ranging from 631.8 to 779.4 ^{o}C and pressures from 0.5 to 0.2 kbar that equivalent to a depth of 1.38 km for amphibole clusters.

Petrology and geochemistry elements present with similar correlation on most diagrams suggest that they were probably generated from a similar magma source and melting of oceanic crust and sediments but experienced slightly different degrees of partial melting or by mixing lower juvenile crust melts. The copper-gold mineralization related Bronze Fox intrusion are estimated fO_2 contents by amphibole chemistry in the monzodiorite and tonalite, ranging from -11.8 to -13.0 and -10.8 to -13.2, respectively, indicating that these rocks probably crystallized at relatively oxidizing conditions above the nickel-nickel oxide (NNO) buffer, yielding an overall range between NNO +2.6 and NNO +1.4, that are characterized by high oxygen fugacities, high Ce^{4+}/Ce^{3+} ratios reflect oxidizing magmas that indicating quite a good potential for porphyry Cu-Au mineralization in the region. Based on our data, we suggest a new tectonic model of arc magmatism which is response to the subduction of the Paleo Asian Ocean in the Lower Carboniferous.