

Ni-Co-Cu sulfide mineralization in the Hwanseon deposit, Hongseong area, Republic of Korea

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We report the Ni-Co-Cu sulfide mineralization and geochronology in a diopside-bearing amphibolite from the Hwanseon Ni deposit in the Hongseong area, where Precambrian Gyeonggi massif complex is widely distributed in western Korea. The deposit is located within, so called “the Hongseong collision belt” which extends to the Qinling-Dabie-Sulu belt in China. The deposit, which has produced 0.4 kt (>4% Ni), is currently closed its operation. Rocks in the deposit consists of Precambrian paragneiss, Paleozoic amphibolite and Mesozoic foliated granite. The SHRIMP zircon U-Pb ages of amphibolite and foliated granite are 472-425 Ma and 233 Ma, respectively. The amphibolite contains approximately 80-85% hornblende and 15-20% other minerals including diopside, epidote, quartz, K-feldspar, plagioclase, biotite, muscovite, chlorite, monazite, ilmenite, titanite, pyrrhotite, pyrite, chalcopyrite, pentlandite, millerite, Co-mineral and Fe-oxide phases. Petrographic, geochronological and geochemical studies for the amphibolite show that its gabbro composition originated in a volcanic-arc setting around 472-425 Ma. This finding is consistent with the results of study[1], which reported that metabasites and metabasaltic andesites in the Baekdong area, located near this deposit, originated in an arc setting around 470–437 Ma, and underwent intermediate-P/T metamorphism (6.2–8.2 kbar, 620–700°C) around 418–405 Ma. Ni orebodies in the Hwanseon deposit occur either at the boundary of paragneiss (mica schist) and amphibolite, or within paragneiss or amphibolite. The sulfides consist of massive or disseminated forms of pyrrhotite-pyrite-pentlandite-chalcopyrite assemblages. Some fractured predating pyrrhotite are partially replaced of filled by millerite and Co-mineral. The Ni and Co contents in the sulfide were determined by FE-EPMA, and they were 0.12-1.71 wt.% of Ni and 0.10-0.19 wt.% of Co in pyrrhotite, and 0.11-3.09 wt.% of Ni and 0.14-0.18 wt.% of Co in pyrite. Based on the geochemistry and petrography, the Ni-Co-Cu mineralization in the Hwanseon deposit is associated with immiscible sulfide melt during crystallization of magma of volcanic-arc (472-425 Ma), partly related with re-melting and re-precipitation during intermediate-P/T metamorphism (418-405 Ma) and Triassic magmatic activity (233 Ma).

[1] Oh, C.W., Iimayama, T., Yi, S.B., Kim, T.S., Ryu, I.C., Jeon, J.M. and Yi, K.W. (2014) Journal of Asian Earth Sciences 95, 203-216.