

Ni-potential of the serpentinized ultramafic block in the Andong area of South Korea

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Serpentinized ultramafic blocks occur as small (<1 km²) to medium (1~5 km²) sized ellipsoidal intrusive shape in several areas of South Korea. Andong ultramafic block (AUB) with medium size is located in a tip part of Mesozoic sedimentary basin bounded with Precambrian basement in the SE part of Korean peninsula. The AUB area consists of Precambrian gneisses, Jurassic granite, Triassic ultramafic rocks including serpentinite (AUB), Cretaceous sedimentary formations, and basic and acidic dikes. Ultramafic-hosted serpentinite of the AUB was reported as Triassic by the zircon U-Pb age (222.1±Ma). The AUB occurs as an ellipsoidal shape with the size of 4 km (NS) x 1.5 km (EW). The exposed AUB is divided into serpentinized and parental non-serpentinized zones. The former consists of mainly serpentine (antigorite) formed by the hydration of olivine and minorly clinopyroxene and chlorite. The latter is composed of mainly olivine (chrysolite) and clinopyroxene (diopside and augite). The both zones comprise Cr-spinel group (Cr-spinel, Al-chromite, and Cr-magnetite), Ni-mineral (pentlandite), and Fe-minerals (magnetite and pyrrhotite). Cr-spinel group with a complete compositional zoning (inside Al-chromite and surrounding Cr-magnetite) indicates the record of the hydrothermal alteration of the parental peridotite. Pentlandite is the only Ni-sulfide and occurs as a common component in the serpentinized and parental ultramafic rocks. It is replaced by the pyrrhotite in the early stage and the pyrrhotite is replaced by magnetite by the late stage. Pentlandite-Cr spinel-pyrrhotite (or magnetite) show a close association by the crystallization and hydrothermal alteration. The source rock of the AUB is confirmed to be a peridotite (mostly lherzolite ~wehrite~dunite). They show a characteristically high Ni content (59~2980 ppm, mean 1342 ppm), Cr 67 ppm to 4560 ppm (mean 2794 ppm), and Co 45 ppm to 156 ppm (mean 126 ppm). These contents appear similar in the entire AUB, which indicates disseminated Ni-deposits. Ni-Cr-Co mineralization of the AUB is the first to report in this study. Considering from the size of the peridotite body (surface area 6 km² and depth more than 200 m), a common occurrence of pentlandite, and Ni contents (0.13 %), Ni exploration is needed to evaluate the Ni-potential of AUB.