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Mineralogy and Petrology of the Tsagaantolgoi Fe-Pb-Zn Skarn Deposit in South Mongolia

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The deposit of Tsagaantolgoi skarn in South Mongolia has poly-metal mineralization of calcareous skarn type, formed at the boundary between limestone of the Neoproterozoic Oortzog Formation and granite of the Late Triassic-Early Jurassic Bor-Under complex. Petrographic and mineralographic analyses of doubly polished samples were conducted at Akita University using the microscope Nikon eclipse LV100-POL (Japan) and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS).

The results of the petrographic and mineralographic study indicate that the samples collected from the study area /BO-1-BO-27/ are skarn. There are garnets, wollastonite, epidotes, vesuvianites, carbonates, and quartz, which show hypidioblast and microgranoblast textures and have a massive structure. In addition, they are subjected to silicification and carbonatization. There is an enriched concentration of ore minerals in some skarn samples ranging from 5 to 60%.

In the rock, there are ore minerals recognized in the study area including magnetite, pyrite, pyrrhotite, chalcopyrite, hematite, sphalerite, galena, and bornite and secondary minerals such as hematite, chalcocite, zincite goethite, limonite, and some Pb-Zn carbonate minerals. In addition, there are a few aggregations of pyrite and chalcopyrite that intruded sphalerite, and a tendency that big sphalerite and galena isometric grains and veins and veinlets can be noticed during the study. In the study area, there are two possible stages of ore mineralization:

1. Disseminated and patchy magnetites and pyrites formed in the host rock and mineralization range of magnetite-pyrite-chalcopyrite-bornite-sphalerite-galena with veinlets and disseminated structures. Ore minerals were replaced by secondary alteration minerals (hematite, goethite, and limonite).
2. The second stage of mineralization usually occurs along the chlorite, carbonate, and sericite alterations in the host rock, which are altered parts of the primary minerals.

Due to the fact that these alteration zones are also cut by late veins and veinlets, the mineralization stage is strongly correlated with these alteration zones.