Gatsuurt deposit is one of gold deposits in the North Khentei metallogenic belt, the biggest gold productive province of Mongolia, and is located approximately 130 km north of Ulaanbaatar. In this region, gold deposits commonly occur as placer deposits. However, bulks of gold resources are hosted in lode gold deposits. Gatsuurt deposit consists of disseminated and vein type gold mineralization in early Devonian subvolcanic, early Paleozoic granitoid complex, and early Paleozoic meta-sedimentary rocks (Tumur et al., 1995). In this study, fifty two samples with different mineralization types were collected, and ore mineral assemblages and wall rock alteration were investigated to characterize ore mineralization and to recognize mineralization sequence.

According to mineralogical study, there are three types of gold mineralization in Gatsuurt deposit: 1) Intrusion hosted disseminated and stock work type characterized by pyrite (0.5-2mm) and arsenopyrite with two generations, chalcopyrite, jemsonite, sphalerite, galena, bournonite, boulangerite, tetrahedrite, scheelite and fine grained native gold; 2) white to gray colored quartz vein type characterized by medium grained pyrite, sphalerite, chalcopyrite, galena, Ag-rich tetrahedrite-tennantite, geocronite and native gold; 3) silicified zone hosted type consisting of very fine (up to 50 µm) grained sulfides, such as pyrite, arsenopyrite, galena, sphalerite, chalcopyrite, tetrahedrite and native gold, and very fine quartz grains. On the basis of mineral assemblages and textures, three or two mineralization stages were recognized for each ore type: for type 1), stages I, II and III are defined by crystallization of pyrite-I + arsenopyrite-I, pyrite-II + arsenopyrite-II and chalcopyrite + sphalerite + tetrahedrite + galena + jemsonite + scheelite + bournonite + boulangerite + native gold, respectively; for type 2), stage I by pyrite-I + chalcopyrite, stage II by pyrite-II + arsenopyrite + galena + sphalerite + Ag-rich tetrahedrite-tennantite, geocronite and native gold, and stage 3 by native gold; for type 3), stage I by pyrite + arsenopyrite + chalcopyrite + tetrahedrite, and stage II by sphalerite + galena + native gold.

The identified hydrothermal alteration minerals are sericite, quartz, albite and microcline suggest that the pH of hydrothermal fluid was close to neutral pH condition.

Three types of fluid inclusion were observed such as CO₂ bearing inclusions (type 1), H₂O-rich inclusions (type 2), and halite-bearing H₂O-rich inclusions (type 3). Type 1 inclusions are abundant and it may subdivide into 2 types: (1a) larger CO₂ bubble (vapor or liquid phase) than aqueous liquid (<50% of the inclusion volume by visual estimate); (1b) contained >50 vol% aqueous liquid. Homogenization temperature of type 1 between 271 to 355°C, type 2 inclusions are between 194 to 292°C and type 3 inclusions are between 208 to 240°C.

Gatsuurt deposit is suggested as intrusion-related gold system, based on the tectonic and geological setting, hydrothermal alteration, mineral assemblages, texture, mineral composition and fluid inclusion study. However, Gatsuurt deposit is possible to be the orogenic type (gold bearing quartz vein) of deposit and disseminated type ore due to metasomatite alteration. Because characteristics of fluid composition, metal assemblage and alteration are similar (Goldfarb et al. 2000).

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