

Sulfide mineral paragenesis at the Hugo Dummett porphyry Cu-Au deposit, Oyu Tolgoi, Mongolia

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Mineralogical studies of ore and alteration minerals have been conducted for the Hugo Dummett porphyry copper deposit. The Hugo Dummett porphyry copper gold deposit is located in the South Gobi region, Mongolia, is currently being explored for high sulfidation mineralization. This deposit divided into the Cu-rich Hugo Dummett South and the Cu-Au-rich Hugo Dummett North deposits. The Hugo Dummett deposits contain 1.91 percent copper (0.58 billion tonnes in total) and 0.41 grams per ton gold (Ivanhoe Mines). Copper-gold mineralization at the Hugo Dummett deposits is centered on a high-grade (typically more than 2.5 percent Cu) zone of intense quartz stockwork veining. The high grade zone is mainly within the Late Devonian quartz monzodiorite intrusions and augite basalt, also locally occurs in dacitic ash flow tuff. Intense quartz veining forms a lens up to 100 m wide hosted by augite basalt and partly by quartz monzodiorite. The many exploration and a few scientific works were done around in the Oyu Tolgoi mining area; however the nature of copper-gold mineralization and origin of the deposit is not fully understood. Scanning electron microscopy (SEM) and X-ray diffraction (XRD) analysis were applied as main analytical methods.

Hugo Dummett porphyry copper-gold deposits are characterized by three mineralized stages based on our study (1) early stage; (2) middle stage; (3) late stage. Three sulfide mineralization assemblages seem to be partly dependent on the host rock type. The main copper-gold mineralization occurs in the early and middle stages, which is genetically related to the quartz monzodiorite and dacitic ash flow tuff. These main stage ore minerals are spatially correlated with the advanced argillic alteration. The bornite, chalcopyrite, pyrite, sphalerite, tetrahedrite, tennantite, enargite, chalcocite, covellite, molybdenite, gold and eugenite occur as main ore minerals. Eugenite is determined for the first time from this deposit. Sulfide minerals commonly display as a replacement/intergrown and minor exsolution texture in the Hugo Dummett deposits.

Two main types of alteration, namely sericitic (quartz-sericite-muscovite) alteration and late siliceous and advanced argillic alteration (alunite, illite, pyrophyllite, kaolinite, dickite, zunyite, diaspore, calcite and barite) form zonation at the Hugo Dummett deposits. Advanced argillic alteration is widespread in these deposits and mainly hosted by quartz monzodiorite and to a lesser extent in dacitic ash flow tuff and augite basalt. The biotite granodiorite host rock is dominantly altered to quartz-sericite-muscovite. The advanced argillic alteration is overprinting sulfide minerals in the Hugo Dummett porphyry copper-gold deposits.

Furthermore, my study continues on sulfide mineral paragenesis in combination with quartz vein texture and with characterization of ore fluid using SEM-CL analyses including some fluid inclusion and stable isotope measurement.