ABSTRACT

The Kyaukmyet and Shwebontha prospect areas are located west of the Chindwin River and Monywa City in Central Myanmar. It is a part of generally north-south trending Central Volcanic Belt. Gold and associated base metals mineralizations are mainly hosted by Tertiary calc-alkaline volcanic and volcaniclastic rocks which are composed of rhyolite, tuff, lapilli tuff and tuff brecccia as well as hydrothermal breccias. The volcanic and volcaniclastic rocks surrounding the mineralized veins are commonly extensively altered. The mineral assemblages show that the types of alteration include silicification as well as argillic and propylitic alteration. The alteration mineral assemblages include quartz, adularia, calcite, chlorite, epidote, kaolinite, sericite, illite and illite/smectite.

A variety of quartz vein textures are observed in mineralized quartz veins. They are characterized by primary and recrystallization as well as replacement texures. Most common vein textures are massive, crustiform, colloform, crustiform-colloform, banded, lattice bladed, lattice bladed calcite, lattice bladed calcite replaced by quartz, mosaic, comb, cockade, zonal, plumose, feathery/flameboyant and saccharoidal textures.

Most of the ore mineralization is in open-space filling veins with lesser amounts in replacement and disseminated ore minerals in the volcanic and volcaniclastic host rock. The mineralized rocks contain gold- and base metal-bearing crustiform, crustiform-colloform, or massive quartz veins from the Kyaukmyet prospect and gold-bearing brecciated quartz vein and chalcedonic quartz vein from the Shwebontha prospect. Mineralization vein trends of research areas show ENE-WSW and NE-ENE directions. The most common primary ore minerals in the mineralized veins at the Kyaukmyet and Shwebontha prospects include pyrite, galena, sphalerite, chalcopyrite, and gold/electrum. The predominant gangue minerals are pyrite, quartz, adularia, sericite, and minor amounts of calcite. Covellite, goethite, and hematite occur as late supergene minerals in the shallow portions of the veins. The ore minerals occur as replacements, disseminations, and massive accumulations in the mineralized veins.

The Kyaukmyet and Shwebontha host volcanic and volcaniclastic rocks are classified using major element (TiO_2) and trace elements (Zr, Nb, and Y), and they show that all host rocks fall in the fields of rhyolite. In addition, SiO_2 vs Na_2O+K_2O plot diagram as well as AFM diagram indicate that most of rock samples are classified in the field of the calc-alkaline series. Based on the REE chondrite-normalized spider diagrams, the REE contents of rocks from the research areas are generally similar to those of the upper continential crust.

Two phase of fluid inclusions are observed in mineralized quartz veins as liquid-rich and vapor-rich and coexisting liquid-rich and vapor-rich inclusions are also found. Fluid inclusions in the mineralized quartz veins have homogenization temperatures ranging from 148 °C to 310 °C and salinities from 0.35 wt% to 2.75 wt% NaCl equiv. The quartz in the mineralized quartz veins was most likely precipitated at a depth of 165–540 m below the paleosurface. Hydrostatic pressures at those depths are approximately 15.6 bars (1.56 MPa) and 54.4 bars (5.42 MPa), respectively. Fluid boiling made a more significant contribution to gold and base metals precipitation in this system. In addition, fluid mixing between hot, acidic and saline bearing ore fluid and cooler meteoric water might be also responsible for gold and base-metals deposition. Based on SEM-EDX analysis, FeS contents in sphalerite were estimated in pyrite + sphalerite ± chalcopyrite of Kyaukmyet prospect with the result of 11-11.5 mol% and Shwebontha prospect with the result of 5.2-5.6 mol%

respectively. By a combination of formation temperatures and SEM-EDX results, sulfur fugacity of each quartz vein can be constrained and according to log fS_2-temperature diagram for all quartz veins in the Kyaukmyet and Shwebontha prospects area suggested that they can be classified as intermediate sulfidation state. On the basis of all available data including hydrothermal alteration, quartz vein textures, ore mineralogy, and fluid inclusion data as well as other relevant geological data, it is suggested that the Kyaukmyet and Shwebontha prospect areas were probably formed under low to intermediate sulfidation epithermal conditions.

In relation to the high sulfidation Cu-Au deposit at Letpadaung, a genetic model is established that the low to intermediate sulfidation epithermal systems at the Kyaukmyet and Shwebontha prospects were formed at a distal part by the emplacement of a reduced, near neutral pH, dilute fluids of dominantly meteoric water with minor input of magmatic components typically associated with calc-alkaline to alkaline magmatism, in an volcanic arc environment. The high-sulfidation type Letpadaung Cu-Au deposit was formed proximal to the magmatic source and dominated by low pH, acidic and oxidized fluids.