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A role of potassic alteration on Cu mineralization at El Salvador porphyry deposit, Chile

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Optical microscope and SEM-EDS-CL observations of the “A”, B”, “D” and chalcopyrite veins in the El Salvador porphyry Cu deposit, Chile, revealed that 1) “A” and “B” quartz veins are composed mainly of CL-bright quartz overprinted by CL-dark quartz. 2) These veins are associated with haloes of K-feldspar, which replaces plagioclase and coexists with anhydrite, chalcopyrite and bornite in the host granodiorite. 3) Sulphide minerals (bornite, chalcopyrite and molybdenite) mainly occur in CL-dark quartz in “A” and “B” veins and these sulphides are commonly associated with anhydrite, chlorite, and calcite. 4) Polyphase and vapour-rich fluid inclusions occur in CL-bright quartz, while liquid-dominant two-phase inclusions are present in CL-dark quartz. 5) “D” veins are composed of CL-moderate to dark quartz, with pyrite, sericite, chlorite and anhydrite. 6) Chalcopyrite veins consist mainly of chalcopyrite with minor amounts of quartz and anhydrite. The veins are associated with chlorite and sericite haloes.

These results indicate that Cu mineralization was later than the main quartz crystallization in “A” and “B” veins, and occurred during a sericite and chlorite dominant stage which is similar to “D” vein stage. However, the presence of majority of Cu sulphides in the potassic alteration zone and the common assemblage of K-feldspar with anhydrite, Cu sulphides, chlorite and sericite suggest that Cu mineralization was caused from high-salinity fluids subsequent to the reaction with the host granodiorite. This reaction released Ca^{2+} into the fluids from plagioclase and promoted disproportionation of SO_2, resulting in the precipitation of anhydrite and sulphides at a lower temperature.