

Trace Element Variations of Pyrite and Chlorite Related to Cu Mineralization in the Osarizawa Epithermal Deposit, Akita, Japan

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The Osarizawa polymetallic vein-type deposit in Akita is one of the largest of copper deposits in Japan. The deposit was discovered in 708 and was mined mainly for Cu and Au until 1978. In this study, we aim to reveal the morphological and geochemical characteristics of chlorite and pyrite associated with Cu mineralization in the Utori vein group of the deposit. We employed optical and electron microscopy, electron probe microanalysis, and laser ablation inductively coupled plasma mass spectrometry.

The main gangue minerals in the Utori vein group at +300 masl are quartz and chlorite, and the main ore minerals are chalcopyrite and pyrite with minor sphalerite, galena, hematite, and covellite. Fine-grained euhedral pyrite inclusions in chalcopyrite contain relatively elevated Cd, Sn, Zn, and Sb contents, whereas graphic pyrite contains elevated Au and Mo contents. Atoll pyrite has elevated Co, Ni, and Ag contents, and relatively higher Te content was found in annealed pyrite. Structural formula of chlorite in veins calculated from microprobe data reveals Mg-rich (clinochlore) and Fe-rich (chamosite) phases, whereas chlorite in altered rocks are mainly Mg-rich clinochlore. Concentric banding pattern in radial aggregates of acicular chlorite parallels the variations in Mg, Mn, and Fe contents. Fe/(Fe + Mg) ratio of chlorite ranges from 0.6 to 0.8, with an average of 0.67. Calculated formation temperatures based on AlIV content of chlorite range from 177 to 330 °C, with an average of 274 °C. Chlorite contains minor amounts of Mn, Ti, Na, Ca, K, V, and Zn and trace amounts of Li, Sc, Co, Ni, Ga, Ge, and Sr.