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# Evolution of magmatic hydrothermal fluid at Furikusa sericite deposit, central Japan

Hiroyasu Murakami[1*], Kouji Nakada[2], Atsushi Miyashita[2], Sasaki Munetake[1], Shinichi Takakura[1]

[1]Inst Geo-Resources and Environment, AIST, [2]Sanshin Mining Ind. Co., Ltd, [3]Seikei High School

Furikusa sericite, which is precisely categorized into illite-2M, deposit, Aichi, central Japan, is currently mined by Sanshin mining Ind. Ltd.. The deposit is located at the margin of the Otoge ring-complex that is a Valles-style caldera and composed of middle Miocene pyroclastic and volcanic rocks. The sericite ore bodies commonly occurred at the intersection between EW-striking ring cones and NS-striking dykes. The ore body partly accompanied with acid leached silicified zones.
Here we report Ar-Ar and K-Ar age measurements for selected illites in the deposit, stable-isotope geochemistry of hydrothermal minerals; stable oxygen of illite, quartz and calcite; carbon of calcite ; hydrogen of illite; stable sulfur isotope of sulfide minerals such as pyrite and arsenopyrite. With an integration of these isotope data with fluid inclusion studies including temperature and salinity of the hydrothermal fluid, we illustrate an interpretation for an origin and evolution of hydrothermal activity of the Furikusa deposit.
Illite gave $^{40}Ar/^{39}Ar$ plateau age of 14.5 +/- 0.2 Ma, which is consistent with the K-Ar ages for illites ranging from 14.2 +/- 0.4 to 14.7 +/- 0.3 Ma. The ages correspond to the stage of the dykes of the Otoge ring-complex.
More than 90 % fluid inclusions from quartz and calcite in the sericite ore body are of vapor-rich, although liquid-rich inclusions are also rarely present. It is apparent that a hydrothermal fluid associated with illite formation was principally enriched in vapor phase. Average homogenization temperature and salinity for fluid inclusions in quartz is 299 ℃ and 3.8 wt% NaCl equiv., respectively. Pressure for illite formation can be estimated less than 0.2kb (20MPa) by some boiling assemblages possessing the same ranges of homogenized temperature and salinity.
The $d^{34}S_{CDT}$ values of sulfides range from -1.5 to -0.33 permil; implying their genetical link with a reduced magma. Stable isotopic data require a magmatic-hydrothermal origin for the illite, typical for high-sulfidation gold mineralization. The $dD_{H2O}$ and $d^{18}O_{H2O}$ values for illite-forming hydrothermal fluids varying from -10 to -15 permil and from +5.2 to +8.1 permil, respectively. They suggest a predominance of magmatic water, without any meteoric contribution.
According to these data, Furikusa sericite deposit was formed at relatively shallow crustal levels (>1.0 km), and by a vapor dominant fluid related magmatic hydrothermal system associated with the Otoge ring-complex. Spatial relationships between the sericite ore bodies and acid leached alteration zones indicate the magmatic fluid was characterized by acidic fluid. Such an acidic fluids is likely to react with andestic pyroclastic and volcanic rocks, resulting in the sericite deposit.
The hydrothermal system, characterized by the assemblage of quartz-sericite-pyrite, in the Furikusa deposit closely resembles to the later stage in the hydrothermal system, QSP veins, of typical porphyry copper deposits. The magmatic vapor dominant nature here in hydrothermal system of the Furikusa deposit is also similar to a hypothetical process described by an ascending magmatic vapor to a shallower high-sulfidation gold deposit. The accurate quantification of gold and other elements in fluid inclusions in the quartz by LA-ICP-MS will be investigated and discussed; it may provide constraints for further understanding the source of the mineralizing

fluid.

Keywords: Sericite, Fluid inclusion, Epithermal gold, Oxygen and carbon isotopes