

Advanced Argillic Alteration and Geochemistry of Alunite in the Iriki Gold Exploration Area, Hokusatsu, Japan

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The Hokusatsu district hosts the largest low-sulfidation epithermal gold-silver system in Japan, with the world-class Hishikari gold deposit included. The Iriki area, located 30 km southwest of the Hishikari deposit, is considered as a prospective gold exploration area, supported by several geological evidence such as presence of the large kaolin deposit exploited by open pit, record of small-scale gold-silver underground mining and drilling results by the government exploration campaign in 1990s. Due to its potential, an Australian-based company has been conducting exploration since 2020. This study reports the results of field survey and laboratory analyses, elucidating the rock textures, alteration mineral assemblages and whole-rock chemical compositions on the surface of the Iriki area. The surveyed area was classified into five zones: unaltered zone, smectite zone, cristobalite zone, alunite + quartz zone and kaolinite zone. Cristobalite zone is distributed separately in the western and eastern parts of the area, with the eastern side exhibiting more extensive and thicker distribution. The most noteworthy feature is an occurrence of the advanced argillic zone dominated by alunite + quartz and kaolinite zones, which distribute 1.5 km east from the kaolin open pit. The common presence of crystalline, acicular alunite with diameters of several hundred μm probably indicates the formation by the ascent of acidic hydrothermal fluids derived from magmatic-hydrothermal systems, rather than supergene oxidation or steam-heated acid-sulfate waters. $\delta^{34}\text{S}$ data of the alunite will also be reported for the assessment of the origin of sulfur and the responsible fluid. Although the acid alteration zone lacks residual quartz, mineralization of the Iriki area likely includes a high-sulfidation environment due to the occurrence of the hypogene crystalline alunite. Combined with the previous exploration results, the area might possess both high- and low-sulfidation environments, potentially capable of gold mineralization underground.