

Geochemical features of “invisible gold” in pyrites from the Akeshi and Kasuga deposits, Kagoshima, Japan

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In hydrothermal ore deposits, gold is not always observable even when using conventional micro-analytical techniques (SEM or EPMA). In many cases, gold also occurs as submicrometer-sized inclusions or nanoparticles, as well as bounded within the structure of sulfide minerals as Au⁺. This type of occurrence is known as “invisible gold”, and is usually detected using high-resolution imaging techniques such as TEM [1]. Pyrite is the most common host of “invisible gold” and is ubiquitous in most types of ore deposits. The mineralogical form of gold, as well as its spatial association with other elements within pyrite, provide valuable insights about fluid compositions and physico-chemical processes (e.g., boiling) [2]. This information is of great importance to reconstruct the evolution of ore systems, but also provide insights that allows us to optimize beneficiation and smelting processes.

In this study, we report the geochemical features of invisible gold in pyrites collected from the Akeshi and Kasuga high-sulfidation epithermal gold deposits, located in the southern part of the Kagoshima Prefecture in Japan. In both Akeshi and Kasuga, visible gold minerals were only reported in high-grade ores, while the occurrence of gold in lower-grade ores remain uncertain [3]. Here we report results of EPMA and LA-ICP-MS analyses of Au and associated trace elements in pyrite, the most common sulfide mineral in the Akeshi and Kasuga deposits.

References: [1] Cook & Chryssoulis (1990) *Can. Mineral.* **28**, 1-16; [2] Román et al. (2019) *Geochim. Cosmochim. Acta* **246**, 60-85; [3] Nakamura et al. (1994) *Resour. Geol.* **44**, 155-171