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Morphology characteristics and chemistry composition of pyrite of Laowangzhai gold deposit in the Ailaoshan orogenic belt, SW China

ZHAO K, YANG Lq, LI P and XIONG Yq

China University of Geoscience, Beijing, China 100083

Laowangzhai gold deposit is the largest gold deposit in the Sanjiang Tethys metallogenic domain, whereby pyrite acts as the dominate gold-bearing mineral. Five generations of pyrite have been identified in diagenetic-metallogenic process, based on the crosscutting relationships of different auriferous veins, ore textures, and mineral paragenesis. Hydrothermal gold mineralization period could be further subdivided into four stages: Stage I quartz-sericite-pyrite stage, Stage II quartz-polymetallic sulfides stage, Stage III calcite-quartz-arsenopyrite-pyrite stage, and Stage IV calcite-quartz-stibnite-pyrite stage. The sedimentary-diagenetic period is mainly characterized by framboidal pyrite which is enriched in Pb, Zn, Mn, Co, Ni, and Bi. During the hydrothermal mineralization period, the crystal form of pyrite evolves as coarse xenomorphic grain → cube → pyritohedron → cube. These pyrites are also enriched in Pb, Zn, Mn, Co, Ni, and Bi, with different enrichment in Au, As, Sb, and Cu. Stage III is the main mineralization stage which is characterized by pyritohedron pyrite, and the pyrite is enriched in Au, As, Sb, Pb, Zn, Cu, Co, Ni and Bi. The hydrothermal period is characterized by the Au positively correlating with As, which suggests the Au and As formed the $[\text{Au}, \text{As}]^{2-}$ and $[\text{Au}(\text{As}, \text{S}^3)]^{2-}$. These two complex compounds replaced $[\text{S}^{2-}]^{2-}$ and then formed pyrite. The ore-forming fluid is mainly in an physical-chemical environment of middle-to-low temperature, with high sulfur fugacity, slow cooling rate, and sufficient mineral source.

Key words: Laowangzhai gold deposit, pyrite, trace element, ore-forming fluid

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* Corresponding author. E-mail: lqyang@cugb.edu.cn