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The Mineral Characteristics and Metallogenesis of Scheelite in the Zhaishang gold Deposit in the Western Qinling Orogenic Blet

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Located in the western part of the Min–Li metallogenic belt within the western Qinling Mountains, the Zhaishang gold deposit is a giant Carlin-like disseminated gold deposit discovered recently[1]. The ore deposit is present both in rocks of low grade metamorphic Middle Devonian and Lower Permian clastic formation, which is composed of quartz sandstone, siltstone, calcareous slate and argillaceous limestone. Gold mineralization is strictly controlled by a fault zone. Minerals in ores are quite complex and consist of sulfides, sulfosalt, oxides, sulfate, carbonate, tungstate, telluride, native metals, and polymetallic alloys. The diversity of mineral in the ores and the existence of microscopic visible native gold constitute the outstanding features of the gold deposit.

On the basis of chemical–analytical data, parts of the deposit can be delineated as independent scheelite orebodies characterized with the association Au–Sb–W (gold–scheelite–stibnite)[2]. Three well-known epochs of mineralization are the sedimentary diagenesis, the hydrothermal mineralization, and the supergene oxidation. The hydrothermal mineralization epoch can be subdivided into five stages: (1) Stage I, represented by the association pyrite–quartz; (2) stage II, represented by the association As-bearing pyrite–arsenopyrite–pyrrhotite–quartz; (3) stage III, represented by the common association pyrite–chalcopyrite–tetrahedrite–galena–sphalerite–stibnite –scheelite–gold–calcite with quartz; (4) stage IV, represented by the association of tellurides and calcite with less sulphides, and (5) stage V, represented by the association calcite–siderite. Stages II to IV are the main stages of mineralization[1].

Generally tungsten is prone to accumulate in magmatic fluid and precipitate in mesothermal to hypothermal condition. However, fluid inclusions in scheelites homogenize at 150～270 ℃and reveal that formation of the deposit involved fluids containing H_2O with or without carbonic species and low concentrations of several salts. Furthermore, trace element geochemistry of scheelite shows high concentrations of Sr and Y compared to Mo, with a depletion of high field strength elements such as Nb, Ta, Ti and Bi, which eliminate an immediate influence form igneous intrusions. Scheelite displays bell-shaped chondrite-normalized REE patterns, which is high contents of REE and middle REE (MREE)-enriched with slightly negative Eu-anomaly. Microthermometric data and trace elements composition imply a role of long-evolved magmatic water in distal intrusion-related settings but nevertheless consistent with a magmatic and crustal source for metal. For example, scheelites record equally low contents of Na, LILEs, and HFSEs and comparably low Fe^{3+}/Fe^{2+} ratios, suggesting very similar nature of the fluid which was low in salinity, trace element poor and reducing in nature, indicating a metamorphic parentage. Additionally, a zoned pattern also observed in a single scheelite grain, which records distinctive differences in chemistry, probably represents distinct pulses of hydrothermal fluids that varied significantly in their compositions.

In view of experimental research findings on the solubility of tungsten minerals and speciation in hydrothermal solutions[3, 4], a conclusion can be safely drawn that the tungsten would probably be carried by tungstate species in hydrothermal systems and the crystallization of scheelites is attribute to the increase of pH caused by the reaction between ore-forming fluids and calcareous wall rocks.

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References:

[1] Liu J J et al.(2015) Ore Geology Reviews 64: 273–298

[2] Liu J J et al.(2008) Geology China 35: 1057–1064 (in Chinese with English abstract)

[3] Wood S A and Vlassopulos D (1989) Geochimica et Cosmochimaca Acta 53: 303–312

[4] Wood S A and Samson I M (2000) Economic Geology 95: 143–182