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Geological Genesis and Prospecting Criteria of the Shanxi Youyu Gold Deposit

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Abstract: The Shanxi Youyu gold deposit is located in Houyaozi-huoshaotan area, Youyu county, Shanxi Province, it is a new type of gold deposit newly discovered in the northwest area of Shanxi Province in recent years. The mineral deposit experienced "from scratch, from small to large, from unknown to known" after reconnaissance-prospecting-general exploration and other geological exploration stages. The understanding of its metallogenic geological characteristics and its genesis gradually tends to be thorough and perfect.

The Shanxi Youyu gold deposit is located in the North China Plate (Ⅰ) the northern margin of North China Plate active belt (Ⅱ) and Lingeer–Fengzhen tectonic uplift (Ⅲ) Youyu boards concave (Ⅳ). The tectonic strata in the mining area can be roughly divided into two geological units, the east and the west, the west area is the ancient metamorphic crystalline basement structure layer, which is mainly composed of the Neoarchean gneiss (complex) of Jining Gr and the Paleoproterozoic metamorphic garnet granite; And the east area is cap rock, mainly composed of the Cenozoic quaternary and a few Mesozoic sedimentary covers; The strata are distributed in general NE-SW direction。The structure closely related to gold mineralization in the area is mainly shear zone structure, in the Neoarchean Wutai stage, it was characterized by ductile and strong deformation, that is, ductile and strong deformation shear zone was formed; In the Paleoproterozoic Lvliang stage, it was characterized by medium strength ductile-brittle superimposed shear deformation. In the Neoproterozoic jinning stage, it was characterized by relatively weak brittle deformation, they are usually the evolution and superposition of ductile shear zone structure formed in the early stage in the later stage. The gold ore bodies mainly occur in ductile-brittle shear deformation zone and are strictly controlled by shear structure. The known main ore bodies are located in the east and west key mining areas of huoshaotan village and houyaozi village respectively. No. Ⅰ and No. Ⅱ ore bodies are located in the west of houyaozi village, engineering control length 470 m, deeping 150 m; The ore body thickness is 1.03–9.98 m, with an average of 2.97 m; Ore bodies occured mainly in the form of veins or lenses, north east-south west trend; Ore grade is between 1.00–13.94 g/t, with an average of 2.26 g/t. No. Ⅳ ore body is located in the west of huoshaotan village, engineering control length 720 m, deeping 330m; The ore body thickness is between 0.89–39.47 m, with an average of 15.41 m; Ore bodies occured mainly in the form of veins or lenses, with many branches and stones, The trend is approximately in the near east-west direction; Ore grade is between 1.00–27.12 g/t, with an average of 1.89 g/t. Secondary alteration such as pyritization, silicification, limonization, carbonation and chlorinization are common in the wall rocks near the mine. The main ore bearing rocks are: Mylonitization silicon-bearing biotite garnet monzonite gneiss, fragmentation garnet K-feldspar gneiss, gneissic fragmentation garnet granite, etc., The ore structure is often irregular other-shaped granule, semi-idiomorphic granule and mylonitic fragmentation structure; The ore structures are mostly disseminated, veinlets disseminated and massive. The natural gold is mainly irregular flaky, bay, dendritic, etc. The occurrence of gold is mainly fracture gold and crystalline fracture gold.

The genesis of the deposit is closely related to the ductile-brittle shear tectonic belt developed in the region. (1) The geological bodies of the deposit occur in the shear tectonic belt and are strictly controlled by the shear structure. Ductile-brittle shear structural belt and its secondary brittle fracture structural fissures are not only good ore conducting channels (ore-transmitting structures), but also good ore bearing sites (ore-bearing structures). (2) Gold mineralization is mainly produced by hydrothermal activity, from the ore-forming fluid has been tested in this area, the δD-δ^{18}O relationship diagram shows that the projection point of hydrogen and oxygen isotope composition is closer to the metamorphic water range, so the ore-forming fluid is mainly from metamorphic hydrothermal. (3) Mineralization material mainly comes from the surrounding rock, the mineralization element Au has no selectivity to the surrounding rock, almost can be produced in all the surrounding rock series in this area, the movement of the mineralization fluid is mainly in the form of infiltration metasomatism. (4) Gold mineralization can be roughly divided into four stages: at the early stages, the metallic sulfides such as pyrite gradually changed from the initial starlike point to disseminated and veinlet-disseminated. At the Middle stage, pyrite and other metallic sulfides continuously form veinlike, netted veinlike and blocky and fill the altered rocks in the early stage, with strong silicification and increasing chalcopyrite, this stage is the main metallogenic stage. At the Late Stage, under the action of brittle tectonic deformation, tensile fractures are often formed, quartz and pyrite veins are often formed, and coarse-grained gold occurs. (5) the mineralization of gold lags later than the ductile-brittle shear process, there is time difference between mineralization and shear action, the shear action creates a metallogenic space and provides a good channel and space for the movement of metallogenic materials. Therefore, we believe

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that the geological genesis of the deposit is mainly a metamorphosis-hydrothermal gold deposit related to the ductile-brittle shear zone.

The mainly prospecting signs include: (1) Stratigraphic structural indicators: the ductile-brittle shear zone and the secondary brittle structure derived from it are macroscopic indicators of ore prospecting. The central part of the ductile-brittle shear zone is generally characterized by schistose development, strong deformation such as mineral remelting and stretching, the rocks (ore) are relatively broken. (2) Wall rock alteration indicators: the surface of ore-bearing rocks (sections) is generally subject to strong alteration such as limonization, sericitization and carbonation, with the color of yellowish-reddish-brown, which is mainly formed by wind oxidation of metal-bearing sulfide rocks (minerals). (3) Geophysical and geochemical anomaly indicators: The gold ore body occurs in the metallic sulfides developed geological body, and the surrounding rocks have obvious electrical difference. In addition, the geochemical anomalies in this area are characterized by the good combination of Au and As anomalies. The ores with high gold grade are closely related to chalcopyrite, and Cu anomalies can indirectly indicate the existence of gold ore bodies.

According to the total indentified resources till now, the Shanxi Youyu gold deposit is a medium-sized gold deposit, and it is still under geological exploration. Through further geological exploration, it is expected to achieve greater breakthroughs.

Keywords: Ductile-brittle shear structure, ore-transmitting structures, ore-bearing structures, pyritization, ore-forming fluid

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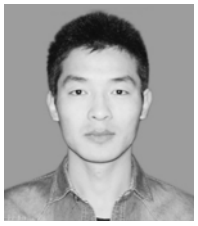

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