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Comparison between the Shuiyindong and Nibao gold deposits, southwestern Guizhou

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Shuiyindong and Nibao are the two largest gold deposits in the tableland lithofacies area, southwestern Guizhou, with cumulative gold resources of 70.2 t and 260.45 t, respectively. To provide theoretical guidance for gold targeting in southwestern Guizhou, the similarities and differences between the two gold deposits are analyzed based on recent advancements in exploration and research at the deposits.

(1) Metallogenic and geologic characteristics: Faults and anticlines are the main ore-controlling structures at the two gold deposits. The Shuiyindong deposit contains stratabound orebodies and minor fault-controlled orebodies, with the gold resource of the stratabound ore, present as disseminated bodies in altered wallrock, being nearly 70 t. The Nibao deposit is mainly a fault-controlled type, with 83% of the total resource controlled by F1. Ore-bearing rocks of the Shuiyindong deposit are mainly composed of clastic limestone, breccia, and calcareous siltstone, whereas at Nibao they are mainly breccia, mudstone, and tuff. The deposits exhibit similar mineral and alteration assemblages. The gold-bearing minerals in the two deposits are mainly pyrite and arsenopyrite. Gold is present as invisible particles or in solid solution in sulfides, with little visible gold.

(2) Ore-forming fluid characteristics: The Shuiyindong deposit contains five kinds of inclusions: NaCl-H_2O, CO_2, CO_2-H_2O, hydrocarbon, and hydrocarbon-H_2O. Ore fluids were medium to low temperature (200~220℃), low salinity (5~6 wt% NaCl equiv.), high pressure (1000 ~ 2000bar), weakly acidic, and reduced. In comparision, The Nibao deposite is dominated by gas-liquid inclusions, and less commonly contains three-phase CO_2 inclusions and daughter mineral-bearing inclusions, with low temperatures (100 ~ 280℃), low salinities (≤6% NaCl equiv.), and low densities (0.54 ~ 1.03 g/cm3).

(3) Ore-forming material: The Shuiyindong deposit shows $\delta^{18}O(H_2O)$ values from 2.1‰ to 12.4‰, $\delta D(H_2O)$ values from -91‰ to -56‰, $\delta^{13}C$ values from -7.3‰ to -3.7‰, and δ18O(V-SMOW) values from 15.5‰ to -23.2‰. The $\delta^{34}S$ values in the core of zoned pyrite varies from -31.8‰ to 41.4‰, whereas the outer zones range from 2.7‰ to 3.2‰. The $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{208}Pb/^{204}Pb$ values of hydrothermal pyrite range from 17.942 to 18.452, 15.532 to 15.642, and 38.158 to 38.729 respectively. The $^{20}Ne/^{22}Ne$ and $^{3}He/^{4}He$ values of fluid inclusions in minerals related to mineralization range from 9.47 to 9.96 and 0.012 to 1.436, respectively. In contrast, the Nibao deposit shows $\delta^{18}O(H_2O)$ values from 4.4‰ to 13.5‰, $\delta D(H_2O)$ values from -85‰ to -47‰, $\delta^{13}C$ values of calcite from -7‰ to -1.6‰, and $\delta^{34}S$ values of pyrite in ore samples between -1.8‰ and +0.9‰,with an average of -0.40‰. In brief, the carbon, hydrogen, oxygen, sulfur, lead, and noble gas isotopic geochemistry shows that the ore-forming materials are mainly derived from a deep magma.

(4) Metallogenic age: The metallogenic age measured by Sm-Nd dating of calcite associated with mineralization in the Shuiyindong deposit is 134 ±3Ma ~ 136±3 Ma, whereas the arsenopyrite Re-Os age of stratabound orebodies is 235 ± 33 Ma. The Rb-Sr age of quartz fluid inclusions in the Nibao deposit is 142±2 Ma. These ages indicate that the gold deposits formed in then Indosinian-Yanshan epoch.