

Genesis of the Hehuashan zinc-lead deposit and implication for mineralization in the Tongling area, China

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The Hehuashan zinc-lead deposit (0.30 Mt Zn, 0.10 Mt Pb) is located in the Tongling area of the Middle-Lower Yangtze Belt, Anhui Province, China. The Tongling area is the largest Cu-Au-Fe area in the belt, and it is located in the center of the belt. The dominant lithologies in the Tongling area are marine and continental sedimentary rocks. The marine sedimentary rocks include clastic sedimentary rocks, carbonates, and evaporites, from Silurian to Middle Triassic in age, but lacking Middle-Late Devonian rocks. Continental sedimentary rocks include clastic and volcano-sedimentary units ranging from Middle Jurassic to Quaternary. Northeast-trending folds affected the rocks of this area, accompanied by a series NE- and NW-striking fault systems. Mesozoic intrusions are widespread in the Tongling area, and are dominated by pyroxene diorite, quartz diorite, and granodiorite, closely related to Cu-Au mineralization. The Hehuashan orebodies are stratabound and hosted by limestones of the Triassic Lower Nanlinghu Formation. Intrusions of diorite and quartz diorite occur near the mine, but skarn minerals are absent. The alteration of the intrusions is dominated by sericite, kaolinite, and carbonate. Sphalerite in Hehuashan can be divided into two types based on color, grain size and associated gangue minerals. Type I sphalerite occurs as yellow and brown fragments composed of fine-grained (~40 μ m) crystals, hosted by a black matrix consisting of calcite, sericite, and quartz; its distributions suggests a stratabound body. Type II sphalerite is brown, coarse-grained (~1mm), and occurs in the calcite cement of limestone breccia or in marble.

We tested the composition of the two types of sphalerite using electron microprobe analysis, and plotted the data to compare with other types of deposits. A triangular plot of Zn vs Fe vs Cd distinguished between skarn and MVT deposits; the Hehuashan data overlap with MVT results, although the setting of the Hehuashan differs from that of MVT deposits. The stratiform nature of Type I sphalerite and evidence that it deposited with its matrix but was broken up *in situ*, suggests a possible syn-sedimentary origin. The Type II sphalerite is in a discordant body and may be related to emplacement of intrusions. Stratabound orebodies occur in several deposits in the Tongling area, e.g., Dongguashan, Xinqiao, and Shimenkou, but the origins of these deposits are debated. Two models have been proposed: syngenetic deposition with disturbance by Yanshanian intrusions, or magmatic replacement. Ongoing research on the Hehuashan deposit aims to determine its origin, as constraining its genesis will provide important guides to continuing exploration in the Tongling area.