

The genesis of the Luanling gold deposit: Implications for gold mineralization in the southern margin of the North China Craton

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The gold-rich Xiaoqinling-Xiong' ershan region in eastern Shaanxi and western Henan provinces, central China, lies about 30-50 km inland of the southern margin of the North China Craton. More than 100 gold deposits and occurrences are concentrated in the southern margin of the North China Craton. Late Archean gneiss of the Taihua Group, and Middle Proterozoic metavolcanic rocks of the Xiong' er Group are the main host rocks for the deposits. Numerous WNW- and NE-striking faults are developed in the Xiong' ershan-Waifangsahn region. Several Mesozoic granitic suite and porphyritic granite dikes occur in the region. The Luanling gold deposit in the Xiong' ershan area is located in the southern margin of the North China Craton. The deposit consists of three orebodies that are hosted in Paleoproterozoic andesites to basaltic andesites. The gold mineralization is mostly concentrated in quartz veins and hydrothermally altered rocks that are developed along roughly NW-trending faults. Ore-related hydrothermal alteration has produced various mixtures of K-feldspar, quartz, sericite, chlorite, epidote, carbonate, and sulfides. Ore minerals mainly consist of pyrite, molybdenite, galena, sphalerite, farnatinitite, telluride and minor bornite, chalcopyrite, enargite, betekhtinite and chalcocite. Gangue minerals include barite, rutile, monazite, xenotime, gypsum and celestine. Six kinds of telluride are recognized, including hessite, altaite, petzite, Phase A, empressite and Ag_3TeS . Gold occurs mostly as native gold and electrum along the microfractures of sulfides or the contact between sulfide and telluride. The sulfide-telluride forming temperature is about 200°C, \log_{Te_2} from -19.62 to -11.23, \log_{Te_2} from -16.5 to -10.06. \log_{O_2} is gradually increasing, while pH is decreasing. Molybdenite has Re-Os model ages of 162-164 Ma, indicates that the main ore-forming stage is in Late Jurassic. The Re contents of five molybdenite samples from the Luanling Au deposit have a range of 36.3-81.95ppm, except one large value of 220 ppm, indicating the ore-forming materials mainly derived from a crustal-dominated source. The $\delta^{34}\text{S}$ values of sulfide range from -17.6 to -6.2 ‰, whereas that of sulfate are from 6.8 to 11.5 ‰. The ore-forming system $\delta^{34}\text{S}_{\Sigma\text{S}}$ value of 3.5‰ indicates the sulfur of the Luanling gold deposit derived from a magma source. The mineralization evolution mainly occurred in three stages, that is, collisional stage (245-225 Ma), post-collisional stage (225-159 Ma), stretching activity start at Late Jurassic, reaching its peak at Cretaceous (135 -115 Ma). Some gold deposits formed at collisional stage, classified as orogenic gold deposit. Most gold deposits occur at Cretaceous, defined as intrusion-related gold deposit. It is therefore concluded that the Luanling gold deposit was an intrusion-related gold deposit, formed in the post-collision environment.

