

Sediment-hosted Zinc-Lead resources of China

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China is the largest producer of Zn and Pb in the world. The most important resources are from sediment-hosted Zn-Pb deposits located mainly in the Yangtze craton and the Qiangtang orogenic belt of the Himalaya-Tibetan Orogen. Based on recent field studies of many of the major sediment-hosted Zn-Pb deposits in China and reinterpretations of previous work on the deposits, the sediment-hosted Zn-Pb deposits are largely Mississippi Valley-type (MVT) that exhibit characteristics of global MVT occurrences. Of the top 30 sediment-hosted Zn-Pb deposits, 22 are considered MVT deposits. China hosts three of the largest five MVT deposits in the world: Huoshaoyun, an oxidized MVT deposit (48 Mt @ 24% Zn + 5.6% Pb); Jinding, a diapir related deposit (202 Mt @ 6.1% Zn + 1.5% Pb); and Changba-Lijiagou, hosted in a metaevaporites sequence (143 Mt @ 7% Zn + 1.3% Pb). In contrast, China has only one Clastic Dominated (CD) deposit at Dongshegmiao (170 Mt @ 2.85% Zn + 0.6% Pb) of the top 30 CD deposits in the world. Four of the top 30 sediment-hosted deposits in China, previously interpreted to be MVT, are now considered to be magmatic-related carbonate-replacement deposits (CRD).

The most striking aspect of the Chinese MVT ores is the common association of the deposits with evaporites or former evaporite-rich sediment sequences and or halokinetic structures. Within the 22 MVT deposits, 14 have a direct association with evaporites or former evaporite-bearing host sequences. The evaporites and halokinetic processes provide “ground preparation” that determine where MVT ores form. Evaporites in a sedimentary sequence dramatically change the porosity and permeability of the sedimentary rocks through diagenetic processes such as development of secondary porosity containing hydrocarbon and reduced sulfur (e.g. Huize district), evaporite dissolution breccias (e.g. Mayuan, Maozu, Changba-Lijiagou deposits) and halokinetic processes that create chemical and structural traps (e.g. Jinding, Daliangzi, Tianbaoshan deposits). Evaporite-bearing sequences containing gypsum and/or anhydrite provide enormous reservoirs of sulfur that can be converted to reduce sulfur by bacterial reduction (BSR) or thermochemical (TSR) processes, essential for the genesis of large MVT deposits such as the giant oxidized MVT deposit at Huoshaoyun.

Considering the newly discovered MVT deposits in the Qiangtang orogenic belt (e.g. Huoshaoyun), the underexplored diapiric style of MVT ores (Jinding) and the new exploration protocol that includes evaporite and vanished evaporites, the future for additional Zn-Pb resources in China is promising.