SEG 2017 Conference

Evaporites and sediment-hosted Zn-Pb Ores in China: A new perspective

David L Leach*, Yucai Song

*Department of Geology and Geological Engineering, Golden, USA, CO, Email: dleach5100@me.com

China is the largest producer of Zn and Pb in the world. The majority of these metals are produced from non-magmatic related, sediment-hosted Zn-Pb deposits in the Yangtze craton and the Qiangtang orogenic belt of the Himalaya-Tibetan Orogen. These deposits have been historically classified as Mississippi Valley-Type (MVT), sedimentary exhalative (SEDEX), metamorphic or as unique or hybrid ore types. Furthermore, some sediment-hosted deposits in China previously classified as MVT should be classified as magmatic-related deposits that include Fankou, Caixiashan, and Xitieshan. Another complication is that the term SEDX has been broadly applied to many laminated or stratiform ores, regardless of the lack of evidence for an exhalative or syngenetic origin or geologic environment of ore deposition. We use the preferred descriptive term Clastic-Dominated Zn-Pb deposits (CD) for deposits that are consistent with ores hosted in clastic-dominated sequences in marine filled basins.

Based on recent field studies of many of major sediment-hosted Zn-Pb deposits in China and reinterpretations of previous work on the deposits, they are mainly MVT deposits that exhibit characteristics of global MVT occurrences. China is especially endowed with MVT deposits. Within the top 30 largest sediment-hosted Zn-Pb resources in China, 22 are MVT, 2 CD, 1 sandstone-hosted, 1 VHMS (included because it was previously considered to be a CD deposit), and 4 magmatic-related carbonate-replacement deposits.

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 formation of evaporites and halokinetic processes are considered to be “ground preparations” that determine where MVT ores form. Evaporites in a sedimentary sequence dramatically changes 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) and halokinetic processes that create chemical and structural traps (e.g., Jinding, Daliangzi, Tianbaoshan. 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 in the presence of organic matter, essential for the genesis of large MVT deposits.

The conclusion that a significant part of China’s endowment of Zn and Pb is related to former seawater evaporative environments and evaporite-bearing sediments Is more than an academic point. The direct connection between many MVT ores with evaporites and evaporative environments provides additional exploration tools in the search for favorable environments that may host undiscovered MVT ores.