

Geochemical Characteristics of Trace Elements in the Zhugongtang Lead-Zinc Deposit in Northwest Guizhou and Their Geological Significance

LIANGLUN HE¹, JUN WANG², YU LIU¹, JIANZHONG LIU³, RUIDONG YANG¹, JINGCHEN CAI², YANG WANG⁴, SITAO YANG², DAWEN WU², LINYANG LEI², TIAN YANG² AND TINGLIN YUE²

¹Guizhou University

²The 113 Geological Team of Guizhou Bureau of Geology and Mineral Exploration

³Technical Innovation Center of Mineral Resources Exploration Engineering in Bedrock Area and Natural Resources

⁴The 113 Geological Team of Guizhou Bureau of Geology and Mineral Exploration, Liupanshui, Guizhou, 553000, China

Presenting Author: 330372697@qq.com

The Zhugongtang Pb-Zn deposit is the first giant lead-zinc deposit discovered in Guizhou. Presently, research on the Zhugongtang Pb-Zn deposit predominantly focuses on its geological and isotopic geochemical characteristics, with relatively limited attention on trace elements. The present study explains its genesis through trace element characterization. Firstly, the findings reveal that the surrounding rock formations exhibit markedly lower concentrations of As, Sb, and Cd compared to the ore, while the levels of Cu, Cr, Ni, Co, and other lithophile elements, alongside Mo and Ba, remain relatively stable, consistent with the regional geochemical background of As, Sb, and Cd. It is postulated that during the migration of ore-forming fluids, water-rock exchange reactions resulted in the pronounced depletion of As, Sb, and Cd from the surrounding rocks, giving rise to ore-forming fluids enriched in these elements. Conversely, the ore samples demonstrate significantly higher concentrations of Pb, Zn, Cu, Ag, As, Sb, and Cd, ranging from several times to several hundred times higher than those in the surrounding rocks, indicating the association of regional ore-forming elements Pb, Zn with indicator elements Cu, Ag, As, Sb, and Cd. Secondly, sphalerite from the Zhugongtang lead-zinc deposit contains In at less than 2.73×10^{-6} , resembling typical MVT lead-zinc deposits. Thirdly, sphalerite exhibits Ge contents ranging from 5.11×10^{-6} to 178.00×10^{-6} , with an average content of 64.55×10^{-6} , consistent with medium to low-temperature sphalerite, and corroborating fluid inclusion temperature measurement results. Concurrently, sphalerite from the Zhugongtang lead-zinc deposit was found to contain Fe at concentrations ranging from 4133×10^{-6} to 86428×10^{-6} , with an average content of 40006×10^{-6} ; Mn contents ranged from 36×10^{-6} to 2019×10^{-6} , with an average content of 570×10^{-6} . The Fe and Mn contents of sphalerite from the Zhugongtang lead-zinc deposit are much lower than those of sphalerite associated with magmatic or volcanic activities, consistent with lead-zinc deposits related to fluid systems in the central and southern regions. In summary, the trace element characterization indicates