LA-ICP-MS In Situ Sulfur Isotope Analyses of Sulfides from the "Dongchuan-Type" Deposits, Kangdian Region, Southwestern China: Implications for Two Ore Systems

Haitao Lin,* Xinfu Zhao, and Zhikun Su

Faculty of Earth Resources, China University of Geosciences, Wuhan, China, Wuhan, Hubei Province, China, *e-mail, 2450893705@qq.com

The genetic relationship between stratiform ores and vein-type ores in sediment-hosted stratiform copper deposits remains debated. Traditionally, vein-type ores were considered as the products of local remobilization of the stratiform ores. However, this viewpoint has been challenged by some investigators, suggesting that the two types of ores were formed by two or more distinct mineralization events. In situ LA-MC-ICP-MS analyses were carried out to detect $\delta^{34}S$ values of sulfides from different types of ores and hence provide a new opportunity to evaluate the genetic relationship or lack of such between the two types of ores.

Sediment-hosted stratiform copper deposits known as “Dongchuan-Type” are hosted in the rocks of Dongchuan Group in the Kangdian region, southwestern China. The ore-hosting strata consist of a sequence of dolostone and black shales stratigraphically above hematitic sandstone and siltstone. The three largest deposits in this region, the Yinmin, Tangdan, and Lanniping deposits, contain both stratiform orebodies and discordant vein-type orebodies. For both types of ores, pyrite, chalcopyrite, and bornite are the primary sulfide minerals, and they are associated with dolomite, calcite, and quartz.

Sulfides from the stratiform ores have $\delta^{34}S$ values ranging from –3.3 to + 22.1‰, whereas the vein-type sulfides have $\delta^{34}S$ compositions separated into two ranges from –19.4 to + 3.5‰ and +21.0 to + 30.7. The sulfur isotope compositions indicate that the stratiform ores and the vein-type ores from the sediment hosted copper deposits in the Dongchuan district have distinct sulfur sources. We propose that the sulfur in the stratiform ores comes from the thermal reduction of marine sulfate. For the vein-type ores, a black shale and evaporite sequence may have been the sources for the isotopically lighter and heavier sulfur ranges, respectively. The stratiform ores and vein-type ores were therefore likely formed in different mineralization events. Combined with previous work, our results suggest that the stratiform ores formed in a regional mineralization event due to circulation of basin brines, whereas vein-type ores were significantly younger and formed by local hydrothermal events.