Trace Elements and REE Distribution in the Phosphorite-hosted REE Deposit of the Zhijin Region, Guizhou Province, China

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ICP-MS, LA-ICP-MS and TOC analyses have been completed on samples from Linfeichang (LFC) section of the early Cambrian Gezhongwu Formation, Guizhou Province, China. The Gezhongwu Formation consists predominantly of dolomitic phosphorite and phosphoric dolomite, with siliceous phosphorite in the upper most horizon and trace bioclastic dolomitic phosphorite. Francolite is the dominant mineral in the phosphorite.

For all the samples from LFC section As, Ag, Cd, Sb, Pb and U exhibit moderate to strong enrichment compared with upper crust, while the upper layer is also enriched in Li, Zn, Mo and Mn. Francolites in the phosphorite from the lower layer are enriched in As, Sr, Sb, Pb, U, Mn, Ti and are more enriched in Pb, U, Mn, Ti and Sr compared with whole rocks. Francolites from upper layer are enriched in Ni, Zn, As, Sr, Mo, Cd, Sb, Pb and U and contain more Ni and As than whole rocks. The high Zn and Mo in the francolites from the upper layer and high Mn and Ti in the francolites from the lower layer may indicate different depositional environments between lower and upper layers and different oringins of the francolites.

The REE contents in phosphorite range from 200 ppm to 1,900 ppm. Data from LA-ICP-MS show that these REEs are almost entirely contained in francolite. And the francolites from different parts of the section all have high REE contents and share the same REE pattern. NASC normalized REE patterns for both whole rocks and francolites are characterized by MREE enrichment, distinct Ce depletion and a slight positive Eu anomaly. But the REE distribution patterns of dolomites decline to the left, with a distinct negative Ce anomaly and slight negative Eu anomaly. So the REE in the francolite may have the same origin.

TOC data of 4 different sections from early Cambrian indicate that REE contents are related to the TOC contents in the phosphorite. Further analyses are needed to see if TOC contents have any relationship with redox environment or biological process.