

# Petrology, mineralogy and geochemistry of critical elements deposition of the Lopingian (Late Permian) coal-bearing series in western Guizhou, SW China

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There are Ga–Nb (Ta)–Zr (Hf)–REY enrichment layers in eastern Yunnan and Western Guizhou, China. Several critical elements rich layers have been explored in Panxian and Shuicheng of Guizhou Province. However, the distribution and genesis of the deposits are still unclear. Mineralogical and geochemical analysis and petrological investigations were conducted on the drilling core samples of such sedimentary series in order to understand the distribution characteristics of enriched layers of rare metal elements and reveal their formation mechanism. The characteristics of logging data, mineral composition and geochemistry show that the vertical distribution of Ga–Nb–Zr–REE rich strata is related to positive anomaly natural GR strata, distributed in or underlying the strata. It has the characteristics of more layers and higher enrichment degree in eastern Yunnan, lower enrichment degree and fewer layers in western Guizhou. The samples were predominantly composed of clay minerals (illite, berthierine and kaolinite) with minor and rare contents of anatase, calcite, rutile, pyrite. Compared with the UCC, these samples are obviously enriched in Ga, Zr, Y, Hf, Ta and Th. Ga, Zr, Y, Hf are highly positively correlated with Th, while Nb, Y, Ta are less correlated with Th. After chondrite normalized, the enrichment layer samples show obvious negative Eu anomaly. The enrichment of Ga–Nb–Zr–REE in the enrichment layers of the Longtan Formation is related to volcanic ash deposition. The migration of Nb–Zr–Y–REE at the bottom of the Longtan formation is different from that of eastern and northern Yunnan. After deposition, the upper layer is subjected to hydrothermal and leaching, and Nb, Ta, Y, REE migrate and enrich in the underlying strata, so there are high Zr (Hf) and Th and very low Nb (Ta) and REY in the upper layer. Other ore beds were a little effect of hydrothermal and leaching and were basically preserved in the original sediments.

