Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.28012

The Carboniferous karstic bauxite deposits in North China Craton: Distribution and multi-provenance of critical elements

ZHUANGSEN WANG AND DR. YONG LI, PH.D
China University of Mining and Technology, Beijing

The Upper Carboniferous North China Craton (NCC) hosts significant bauxite-bearing strata, enriched with critical elements (B, Li and REEs). Understanding the distribution, provenance and enrichment process of critical elements is significant to evaluate the utilization of critical elements. By geochemical characteristics of bauxite series, U–Pb geochronological dating of detrital zircon, and trace element analysis of detrital rutile, we investigated the spatial and temporal variations in critical elements enrichment in the NCC, focusing on the interactions between provenance characteristics and weathering processes, exploring the metallogenic mechanisms of critical elements. B is primarily enriched in the south region of NCC, influenced by metamorphic and igneous rocks from the North Qinling Orogenic Belt. Li is concentrated in the north region of NCC, largely derived from the weathering products of Mesoproterozoic granites in the Yinshan Block. REE enrichment is most pronounced in the central region of NCC, primarily governed by the intensity of chemical weathering rather than provenance influence. We identified three stages of metallogenic processes of critical elements: (1) karstification and material input (450–315 Ma).Weathering and erosion of source rocks provided the material basis for critical elements enrichment. The input of B occurred primarily between 450–350 Ma from the North Qinling Orogenic Belt, when the paleogeography of NCC was characterized by a southern high and northern low. The input of Li was concentrated between 350–315 Ma from the Yinshan Block, during a period when the paleogeography of NCC shifted to a northern high and southern low. (2) migration and in-situ of mineral-forming materials (315–300 Ma). Weathering and leaching processes facilitated the accumulation of iron-aluminum oxides and critical elements in para allochthonous weathered materials, promoting the further enrichment of REEs. (3) Epigenetic leaching and late modified diagenesis (315–300 Ma). Epigenetic leaching processes further enriched critical elements, resulting in the formation of bauxites series sequences and enrichment of critical elements. Through a comprehensive analysis of provenance and weathering processes, this study offers novel perspectives on the geological factors driving critical metal enrichment, paving the way for more efficient and environmentally conscious resource exploitation.

