

The Global Critical Minerals in Ores (CMiO) Database – A Review and Update

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Critical minerals are essential to modern technologies and national security yet supply chains remain vulnerable to disruption. Identifying and assessing these resources is challenging, particularly because public data on their concentrations is often limited, especially for byproducts in ores mined primarily for other commodities. To address this, the Critical Minerals Mapping Initiative (CMMI), a collaboration among the U.S. Geological Survey, Geological Survey of Canada, and Geoscience Australia, was established in 2019.

A key output of the CMMI is the Critical Minerals in Ores (CMiO) database, a comprehensive resource designed to enhance understanding of global critical mineral distributions. As of May 2025, this database includes a compilation of over 20,000 high-quality multielement geochemical analyses of ore and related samples, representing over 100 deposit types across 10 distinct deposit environments. This database employs a novel, consensus-based classification scheme developed by CMMI (<https://pubs.usgs.gov/publication/ofr20211049>), enabling robust comparisons of geochemical signatures from ore deposits globally.

The CMiO database supports the assessment of both primary and byproduct critical mineral potential. For example, analysis of data from porphyry copper-molybdenum-gold deposits allows for quantification of potential byproduct recovery of elements like tellurium, selenium, and rhenium. Similarly, the database aids in understanding differential enrichment of critical minerals, such as cobalt and rare earth elements, within various types of iron-oxide-copper-gold (IOCG) and iron-oxide-apatite (IOA) groups of deposits, informing exploration and resource assessment efforts.

The CMiO database is a vital, steadily expanding data source for researchers, industry, and governments seeking to understand and secure future critical mineral supplies. An interactive map, the downloadable dataset (<https://portal.ga.gov.au/persona/cmmi>), and a set of data analysis and visualisation tools are publicly available. CMMI invites submission of high-quality geochemical data for well-characterized ore samples to support the continued growth of the CMiO database. A submission guide is available at: <https://doi.org/10.26186/149408>.