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Advances in the Critical Minerals in Ores (CMiO) Database for Mineral Chemistry

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Critical minerals are essential to the modern economy – for energy, manufacturing and national security. Identifying and assessing these mineral resources can be challenging as public data on their concentrations are often limited. 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.

The Critical Minerals Mapping Initiative released the Critical Minerals in Ores (CMiO) database, a flagship product, in 2021. CMiO has been joined, in 2026, by the Critical Minerals in Ores – Mineral Chemistry (CMiO-MIN) database, a companion mineral chemistry database to join the whole rock CMiO. Combined, these two databases have compiled over 40,000 high-quality multielement geochemical analyses of ore and ore-related samples, from over 100 different deposit types and 10 distinct deposit environments (Hofstra et al., 2021). Both CMiO and CMiO-MIN use a CMMI developed classification scheme to enable comparison of geochemical signatures for ore deposits globally.

The CMiO and CMiO-MIN databases centralise geochemistry data that provide essential support for characterising and mapping both primary and byproduct critical mineral potential. These data can provide insight into processes responsible for primary commodity and critical mineral enrichments across mineral systems, the deportment of these commodities, and to support prospectivity modelling applications. For example, analysis of data from lead-zinc deposits quantifies potential byproduct recovery of strategically important elements including gallium, germanium and indium.

The CMiO and CMiO-MIN databases are vital sources for researchers, industry and governments alike, seeking to understand future critical mineral supplies. A web portal (criticalminerals.org) is available to interact with and download data. CMMI invites submission of high-quality geochemical data for well-characterised ore samples to support the continued growth of both databases.