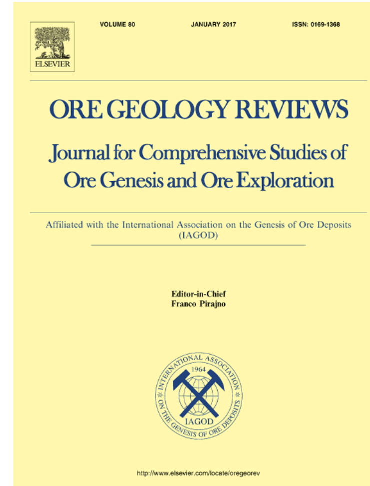

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The world's by-product and critical metal resources part III: A global assessment of indium

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Abstract

Indium has considerable technological and economic value to society due to its use in solar panels and liquid crystal displays for computers, television and mobile devices. Yet, without reliable estimates of known and potentially exploitable indium resources, our ability to sustainably manage the supply of this critical metal is limited. Here, we present the results of a rigorous, deposit-by-deposit assessment of the global resources of indium using a new methodology developed for the assessment of critical metals outlined in Part II of this study (Werner et al., 2017). We establish that at least 356 kt of indium are present within 1,512 known mineral deposits of varying deposit types, including VMS, skarn, epithermal and sediment-hosted Pb-Zn deposits. A total of 101 of these deposits have reported indium contents (some 76 kt of contained In) with the remaining 1,411 deposits having mineralogical associations that indicate they are indium-bearing, yielding ~280 kt of contained indium. An additional 219 deposits contain known indium enrichments but have unquantifiable contents, indicating that our global resource figure of 356 kt of contained indium is therefore most certainly a minimum. A limited number of case studies also indicates that a further minimum of ~24kt indium is present in mine wastes, a total that is undoubtedly smaller than reality given the minimal reporting of mine waste indium concentrations, and the extensive volume of historical mine wastes.

These quantities are sufficient to meet demand for indium this century, assuming current and projected levels of consumption. However, given indium's classification as a critical metal, its supply still remains a concern, and hence we have also discussed the economic viability and spatial distribution of the indium resources identified during this study to further our understanding of the geopolitical scarcity of this critical metal. Our results suggest that the global indium supply chain is fairly adaptable, primarily as the spatial distribution of indium resources deviates significantly from the current supply chains for this metal. Our study provides a stronger basis for future studies of indium criticality, provenance, supply chain dynamics, and stocks and flows in the fields of economic geology and industrial ecology.