Critical Metals in the IOM Deep Sea Deposit (Clarion-Clipperton Zone, Pacific)

Poster

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Abstract

Mineral deposits on the seabed are a large but least explored source of critical metals on Earth. Recently, increasing attention has been given to the potential supply risks of critical metals, such as cobalt and REE. With increasing technological advances, the demand for these critical metals has increased, raising concerns for resource sustainability. The exploitation of seabed mineral resources, such as polymetallic nodules, have been identified as possible critical metal sources. The European Commission periodically reviews the list of critical raw materials for the EU. Economic importance and supply risk are the two main parameters used to determine criticality. Cobalt and REEs are listed as critical raw materials from the first assessment in 2011 and their importance is permanently growing.

Cobalt world reserves are estimated at 7.6 Mt. Primary production (145 kt) was the main source of cobalt supply (80%) in 2020. The Democratic Republic of Congo (DRC) accounted for 66% of global supply. Batteries accounted for 57% of total cobalt consumption. The global cobalt demand increased by more than 5 times between 1995 and 2019. To ensure global e-mobility ambitions boosting of primary cobalt supply is necessary. A cobalt shortage, anticipated between 2028 and 2033, appears inevitable, even under the most optimistic scenario. Primary supply is found to be essential to achieve supply-demand balance.

World reserves of the rare earth elements (REE) are estimated at 120 Mt. Primary production (243 kt) was the main source of REE supply in 2020. China accounted for almost 60% of global supply. Permanent magnets and catalysts accounted for 61% of total REE consumption. Rare earths remain critical in various applications with future demand expected to remain strong, driven by the clean energy economy (especially electric vehicles industry). Recycling rate of REEs is around 5% at present.

IOM deposit resources estimation is based on data collected during marine expeditions. So far, four reports using geostatistical data analysis have been prepared (2007, 2011, 2015 and 2020) and two validations performed by the Competent Person (2016 and 2020). In the IOM´s exploration area following resources were estimated: 12 Mt of Measured resources, 77 Mt of Indicated resources and 183 Mt of Inferred resources, total 272 Mt of wet polymetallic nodules.

In total, cobalt resources represent 335 thousand tons of metal, REE resources are 6 thousand tons of metal contained in the geological resources of the IOM deposit. The REE resource estimate was made only in block H22_NE (628 km2), so there is still big potential within the whole exploration area (75,000 km2). REEs contained in IOM´s seabed polymetallic nodules are mostly light REEs (cerium, neodymium, lanthanum), less heavy REEs (yttrium, gadolinium).

Key words: critical minerals, deep-sea minerals, cobalt, rare earth elements

Sources

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