

Subject: Paper on strategic/critical metals and minerals

Executive summary

Using critical minerals means facing challenges of an economic nature: some of these markets are poorly organised, not very transparent, and most transactions are still carried out over the counter. The location of resources and the strategies of actors (industrial structure, commercial and investment policy, etc.) can make the use of a raw material critical: the large-scale dissemination of technologies using them can potentially create tensions on the markets for these metals.

ISO is an independent, non-governmental international organization with a membership of 167 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.

Since 2015, the creation of new ISO committees on metals and materials has been made at the request of China: Gold (unsuccessfully), Rare Earths and Lithium. It should be noted that the latest ISO committees created cover the sector in a very broad way: from mining to metal recycling. In the past, ISO committees had a narrower scope and focused on metallurgical aspects. The analysis of existing ISO committees shows the presence of SAC (Standards Administration of China). It seems necessary to improve the involvement of European Stakeholders in ISO Technical Committees for stabilizing the market and secure related critical supplies.

In order to support the standardization of critical metals and minerals, AFNOR, the French Standardization Body, will propose the creation of a new Technical Committee at ISO, by mid November 2022. The French industry identified the following metals and minerals: Bismuth, Beryllium, Cobalt, Gallium, Graphite, Hafnium, Indium, Niobium, Palladium/Platinoïds, Silicium, Tantalium, Tungsten, Vanadium, Zirconium.

This is the reason why, we kindly invite you to contact your National Standardization Body to discuss the opportunity to support and join the initiative of AFNOR in creating a new ISO Technical Committee dedicated to Speciality Metals and Minerals.

Specifically, we will welcome your comments (additional metals and minerals to include, scope, working programme). We are also ready to organize web meetings to discuss in deep if your Industry and Stakeholders have specific or major interests for some of these metals and minerals.

General

The technological innovations developed to support the energy transition call for critical or specialty metals: these are ores and refined metals used for

- **fuel cells:** platinum group metals, zirconium,
- **solar and photovoltaic technologies :** cadmium, indium, gallium,
- **battery:** lithium, cobalt, nickel, graphite, silicium
- **aerospace and super alloys :** tungsten, vanadium, titanium
- **electronics :** silicium, tantalum
- **permanent magnets:** rare-earth group metals.

Using critical metals means facing challenges of an economic, technological and geopolitical nature:

- **economic:** some of these markets are poorly organised, not very transparent, and most transactions are still carried out over the counter, without the support of financial market structures such as the London Metal Exchange,
- **technological:** some of these metals are co-products of mining activities; therefore, their extraction and production depend geologically, but also economically, on the production of other metals,
- **geopolitical:** the location of resources and the strategies of actors (industrial structure, commercial and investment policy, etc.) can make the use of a raw material critical: the large-scale dissemination of technologies using them can potentially create tensions on the markets for these metals
- **energy and environment:** today, the metallurgical industry consumes around 10% of the world's energy, with various environmental impacts water consumption, associated energy consumption and emissions from the sector.

Criticality is an approach based on an assessment of the risks associated with the production, use or end-of-life management of a raw material (Graedel and Nuss, 2014). A raw material is critical when

- it is used in sectors, - deemed strategic for the state or the economy (defense, energy, electronics, transports, ...);
- it is difficult to substitute in the short term
- it has many industrial applications with a high economic value.
- its reserves and production are geographically concentrated.

The notion of criticality is not universal. The criticality of a raw material can vary from one country to another, as it actually refers to four levels of risk: geological, economic, strategic availability and environmental.

Identification of strategic/critical metals and minerals

The identification of these strategic minerals/metals can be based on the analysis of the most innovative products existing nowadays: magnets, Li-ion batteries and photovoltaic cells. There are therefore several lists that establish which metals are considered strategic or critical (USA, EU, Brazil, India, OECD, China, Canada, Japan, UK).

At the end of 2021, Standards Australia get the creation and steering of a Strategic Group at ISO on Critical Minerals (ISO/TMB/SAG/Critical Minerals). The objective is to identify which minerals/metals could be standardized in ISO. ISO Strategic Group on Critical Minerals (ISO/TMB/SAG) identified 22 metals/minerals, five are already covered by Asian-led ISO committees or subcommittees. In particular, several minerals or metals have been identified as being of a particularly strategic nature: cobalt, indium, vanadium, graphite, gallium, tungsten.

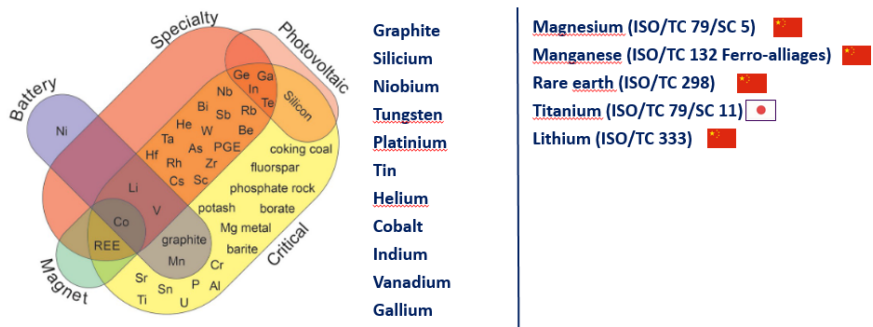


Figure 1 – Strategic/critical metals identified by ISO/TMB/SAG/Critical Minerals

Situation of Standardization on strategic/critical metals

At the international level

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Since its creation, ISO has launched standardization work on metals. Thus, ISO/TC 79 "Light metals" was created in 1953. This committee was extended with the new subcommittees in charge of magnesium and titanium. New committees were then created, as ISO/TC 333 "Lithium" in 2021. The work focuses in particular on classification, traceability, packaging and chemical analysis methods. These methods are used in the settlement of commercial disputes and litigation. Indeed, many disagreements arise between suppliers and customers on the quality of metals and minerals delivered. The ISO standards on chemical analysis methods stabilize the market by providing an international reference method.

Since 2015, the creation of new ISO committees on metals and materials has been made at the request of China: Gold (unsuccessfully), Rare Earths and Lithium. It should be noted that the latest ISO committees created cover the sector in a very broad way: from mining to metal recycling. In the past, ISO committees had a narrower scope and focused on metallurgical aspects. The analysis of existing ISO committees shows the presence of SAC (Standards Administration of China). It seems necessary to improve the involvement of European Stakeholders in ISO Technical Committees in order to stabilize the market and secure the related critical supplies.

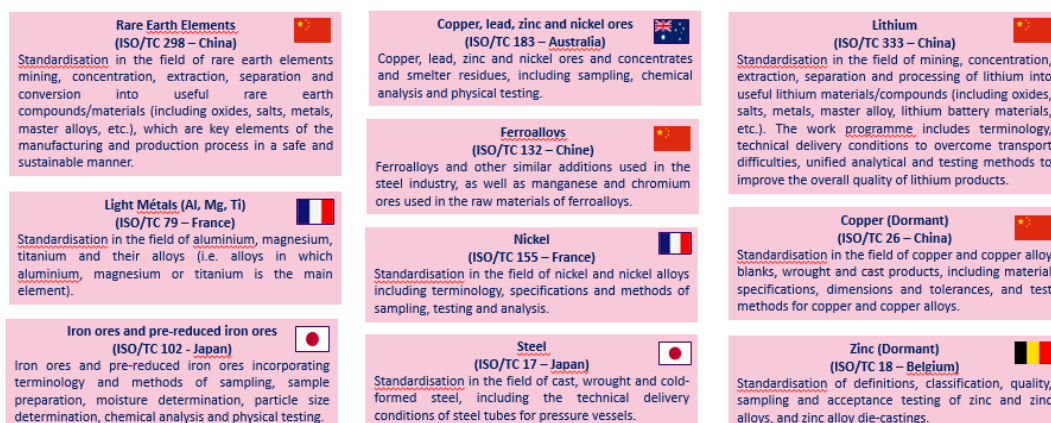


Figure 2 – Mapping of ISO Technical committees in charge of Strategic/critical metals

NOTE: SAC (China) is in charge of steering ISO/TC 79/SC 5 "Magnesium" and JISC (Japan) is in charge of ISO/TC 79/SC 11 "Titanium".

At the European level

The mining and metals sector plays a key role in the EU economy and is crucial to many other sectors, including construction, automotive and electronics. The ever-increasing demand for minerals requires a major standardization effort, with regard to the definition, classification, testing, analysis and technical delivery requirements of the products of the metallurgical industry. The Comité Européen de Normalisation (CEN) technical committees in charge of the standardization of metals is old and has not seen the creation of new committees for decades. In view of the global dimension of this market, standardization at international level seemed more appropriate than at European level.

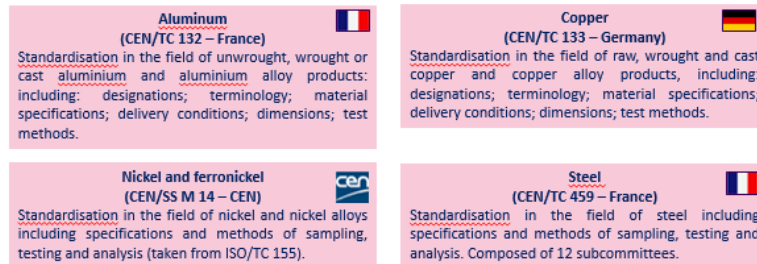


Figure 3 – Mapping of CEN Technical committees in charge of Strategic/critical metals

French proposal for a new ISO Technical Committee on critical metals and minerals

In order to support the standardization of critical metals and minerals, AFNOR, the French Standardization Body, will propose the creation of a new Technical Committee at ISO, by mid November 2022. The French industry identified the following metals and minerals:

| | | |
|-----------|-----------------------|-----------|
| Bismuth | Hafnium | Silicium |
| Beryllium | Indium | Tantalium |
| Cobalt | Niobium | Tungsten |
| Gallium | Palladium/Platinoïdes | Vanadium |
| Graphite | Rhenium | Zirconium |

You are kindly invited to indicate to AFNOR which metals and minerals have a specific interest for your Industry and stakeholders. You can also propose additional metals and minerals.

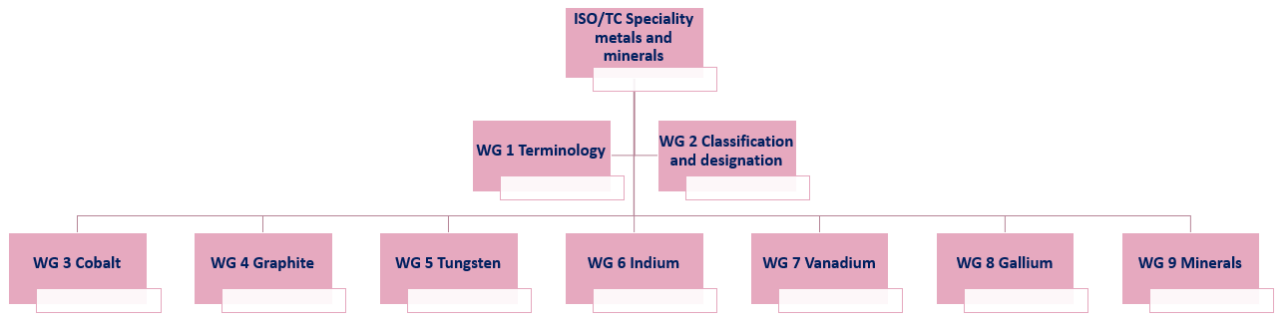
The draft scope of this new ISO Technical committee would be:

*Standardization in the field of Speciality Metals and Minerals concentration, separation. The work program includes terminology, classification, technical conditions of delivery to overcome transport difficulties, unified testing and analysis methods to improve the general quality of Speciality Metals and Minerals. Speciality Metals and Minerals covered by this technical committee are the following: **Bismuth, Beryllium, Cobalt, Gallium, Graphite, Hafnium, Indium, Niobium, Palladium/paltinoids, Rhenium, Silicium, Tantalium, Tungsten, Vanadium and Zirconium (non-fixed list).***

Additional metals and minerals may be added if the extension of the scope is approved by ISO/Technical Management Board.

Excluded: Components, Products, Mining (which are already covered by others ISO Technical Committee).

AFNOR plans to develop two categories standards for specialty metals and minerals, the first category for basic standards (terminology, classification, packaging, marking,...), the second category for testing and analysis methods standards (sampling, specifications and analytical methods for specialty metals and minerals, chemical analysis,...). The works would be developed in several working groups:



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