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Traceability of rare earths in the supply chain from separated products to permanent magnets

Traçabilité des terres rares dans la chaîne d'approvisionnement, des produits séparés aux aimants permanents

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Forward

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This document was prepared by Technical Committee ISO/TC 298, *Rare earth.*

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Introduction

0.1 General

The adoption of a traceability system is a strategic decision for an organization that can assist in understanding the supply chain of its goods, products and services. A traceability system is a useful tool to assist an organization operating within a rare earth supply chain to allow traceability, i.e., between its original material source and its final product manufacturing destination including recycling, and to achieve defined goals and objectives within their overall material management system(s). The design of a traceability system is influenced by regulations, product characteristics, and end-user expectations. The complexity of the traceability system varies depending on the nature of the product(s) within the supply chain, the sources of inputs, and the objectives to be achieved.

While implementation of materials traceability is legally mandatory in many countries, the implementation of a traceability system by an organization also depends on:

— technical limits inherent to the supply chain organization and products (i.e., nature of the materials, size of the lots, collection and transport procedures, processing, and packaging methods);

— the cost and benefits of applying such a system;

— the characteristics of processing;

— the environmental impact, waste treatment and disposal processing.

The potential benefits of implementing a traceability system based on this document are:

— the ability to trace rare earth materials and products between separated products and permanent magnet products;

— the premium value of being able to demonstrate product quality through credible evidence of, for example, production with verifiable sustainability claims as provided by a trustworthy traceability system;

— to reduce and prevent pollution;

— promotion of environmentally responsible and production with verifiable sustainability claims of rare earths permanent magnet products including through the circular economy;

— to align a rare earth supply chain with sustainable development goals;

— to provide better service for users and customers by supplying quality products.

This document can be used by all participants in the rare earth supply chain. However, it is not the intent of this document to specify the need for:

— complete uniformity in the structure of traceability systems for different rare earth supply chains;

— alignment of documentation to the clause structure of this document;

— use of the specific terminology of this document within the rare earth supply chain.

This document specifies factors enabling the traceability of rare earths in the supply chain between separated products to permanent magnets.

In this document:

— “shall” indicates a requirement;

— “should” indicates a recommendation;

— “may” indicates a permission;

— “can” indicates a possibility or a capability.

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Information marked “NOTE” is for guidance in understanding or clarifying the associated requirement.

0.2 Description

This document describes a traceability system covering the rare earth supply chain between separated rare earth products and rare earth permanent magnets. This document specifies standards for digital traceability systems enabling supply chain members to access digitally verifiable information relating to rare earth materials or products as they pass through the supply chain. This information includes the digital identity of each product manufacturer in the supply chain which has handled the rare earth material, product shipment, or production, or both, and recycling. This document thereby makes it possible for the purchasers of rare earth permanent magnets or magnet-making precursor to identify the product manufacturers in the supply chain that were involved in either the production or recycling processes, or both.

This document is an extension of the traceability of rare earths in the supply chain from mine to separated products (see ISO 23664). This extension beyond the separated products is important to provide assurance to consumers that their products contain traceable rare earths and to align the entire rare earth supply chain between mine and finished goods with sustainable development goals in mind. Although it is not a requirement to link the requirements in this document with ISO 23664, it can be useful to do so if the goal is to define a traceability system that spans the entire supply chain from mine to permanent magnet.

The types of businesses in the rare earth supply chain that are considered in this document are the following:

a) Separation production — In which mixed rare earth products from hydrometallurgical plants are separated into one or more relatively pure products each containing one or more specific rare earths to the substantial exclusion of other rare earths.

b) Metal production — Process in which the separated rare earth products such as rare earth oxides are reduced to rare earth metals.

c) Master alloy production — Process in which a rare earth metal is alloyed with one or more elements to provide a master alloy of the required chemical composition that is a suitable precursor for the manufacture of a rare earth permanent magnet(s).

d) Magnet production — Process in which the rare earth master alloy is transformed into a rare earth permanent magnet, with suitable material properties and technologically useful magnetic properties e.g., remanence, coercivity, Curie temperature etc, for use in applications e.g., electric motors, wind turbine generators etc.

e) Traders, brokers, and wholesalers — Entities that handle rare earths products, generally the materials such as oxides, metals, and alloys, possibly re-package or blend powdery material, but otherwise do not change the chemical or physical nature of the rare earth-bearing material,

f) Recycler — Entities that collect, sort, and extract rare-earth-containing materials such as swarf, magnet scrap, and other rare-earth-containing materials that can be reinserted at different points of the rare earth supply chain.

g) Transporters —Businesses that move rare earth products between different businesses in the rare earth supply chain.

h) Downstream users — Businesses or manufacturers that use rare earth permanent magnets to produce downstream products such as cell phones, electrical machinery, vehicles, etc.

The connections between the businesses in the rare earth supply chain for separated oxide products to permanent magnets using NdPrFeB magnets as an example are illustrated in Figure 1.

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