Ce metal production by Molten salt electrolysis

Overview

Based on the Lab scale principles developed at BARC the technology for production of Cerium Metal by molten salt electrolysis has been upscaled on Pilot scale at IREL (India) Limited, RETTP Bhopal.
This enabled the production of cerium metal under controlled conditions with emphasis on product quality, process stability, operational safety, and resource optimization. The technology package is available for transfer to industries and organizations interested in establishing indigenous cerium metal manufacturing facilities.
The transfer of technology includes process know-how, equipment specifications, operational guidelines, safety practices, quality control methodologies, and technical support required for setting up a cerium metal production plant. The overall plant configuration, production capacity, utility requirements, can be customized based on the intended scale of operation.

Process

The process involved is an electro-metallurgical Molten salt electrolysis for producing cerium metal product. The cerrous carbonate raw material is converted in the chloride form and fed to the molten salt electrolysis furnace along with suitable electrolytes. The process is carried out in a controlled environment using specially designed electrolysis equipment and associated auxiliary systems. The technology comprises of feed preparation, electrolyte management, electrolysis operations, metal recovery, product handling, and process monitoring systems. Continuous process control and appropriate operating practices ensure stable production and consistent metal quality. The process has been successfully translated and demonstrated from lab scale to pilot scale (TRL 8).

Salient features

- Indigenous technology suitable for commercial-scale cerium metal production.
- Reduced dependence on imported rare earth metal technologies
- Technology support for plant commissioning and operator training.

Advantages

- Production of high-purity cerium metal.
- Process successfully translated and demonstrated from lab scale to pilot scale.
- Suitable for scale-up from pilot plant to commercial production facilities.
- Improved process control and product consistency.
- Domestic rare earth value-chain development and import substitution.

Areas of application

- Cerium metal for preparation of alloys for hydrogen storage systems.
- Strategic applications for defence, aerospace, and high-technology sectors.
- Manufacturing of specialty alloys and metallurgical additives

Facilities required

- Adequate floor space for production, utilities, storage, and maintenance activities.
- Reliable electrical power supply suitable for electro-metallurgical operations.
- Material handling and storage facilities for raw materials and finished products.
- Cooling water, compressed air, and other utility systems.
- In-House Laboratory facilities for quality control and process monitoring.
- Environmental, health, and safety systems as per applicable regulations.
- Workshop and maintenance facilities for routine plant upkeep.