

RARE EARTHS¹

[Data in metric tons of rare-earth-oxide (REO) equivalent unless otherwise noted]

Domestic Production and Use: Rare earths were mined domestically in 2021. Bastnaesite (or bastnäsite), a rare-earth fluorocarbonate mineral, was mined as a primary product at a mine in Mountain Pass, CA. Monazite, a phosphate mineral, was produced as a separated concentrate or included as an accessory mineral in heavy-mineral concentrates in the southeastern United States. The estimated value of rare-earth compounds and metals imported by the United States in 2021 was \$160 million, a significant increase from \$109 million in 2020. The estimated end-use distribution of rare earths was as follows: catalysts, 74%; ceramics and glass, 10%; metallurgical applications and alloys, 6%; polishing, 4%; and other, 6%.

<u>Salient Statistics—United States:</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021^e</u>
Production: ^e					
Mineral concentrates	—	14,000	28,000	39,000	43,000
Compounds and metals	—	—	—	—	230
Imports: ^{e, 2}					
Compounds	11,000	10,800	12,200	6,510	7,700
Metals:					
Ferrocerium, alloys	309	298	330	274	320
Rare-earth metals, scandium, and yttrium	524	526	627	362	540
Exports: ^{e, 2}					
Ores and compounds	1,740	17,900	28,300	40,000	45,000
Metals:					
Ferrocerium, alloys	982	1,250	1,290	625	740
Rare-earth metals, scandium, and yttrium	55	28	83	25	29
Consumption, apparent, compounds and metals ³	9,300	9,600	11,200	5,400	6,100
Price, average, dollars per kilogram: ⁴					
Cerium oxide, 99.5% minimum	2	2	2	2	2
Dysprosium oxide, 99.5% minimum	187	179	239	261	400
Europium oxide, 99.99% minimum	77	53	35	31	31
Lanthanum oxide, 99.5% minimum	2	2	2	2	2
Mischmetal, 65% cerium, 35% lanthanum	6	6	6	5	6
Neodymium oxide, 99.5% minimum	50	50	45	49	49
Terbium oxide, 99.99% minimum	501	455	507	670	1,300
Employment, mine and mill, annual average, number	24	190	202	185	290
Net import reliance ⁵ as a percentage of apparent consumption: ⁶					
Compounds and metals	100	100	100	100	>90
Mineral concentrates	XX	E	E	E	E

Recycling: Limited quantities of rare earths are recovered from batteries, permanent magnets, and fluorescent lamps.

Import Sources (2017–20): Rare-earth compounds and metals: China, 78%; Estonia, 6%; Malaysia, 5%; Japan, 4%; and other, 7%. Compounds and metals imported from Estonia, Japan, and Malaysia were derived from mineral concentrates and chemical intermediates produced in Australia, China, and elsewhere.

<u>Tariff:</u>	<u>Number</u>	<u>Normal Trade Relations</u>
		<u>12–31–21</u>
Rare-earth metals	2805.30.0000	5.0% ad valorem.
Cerium compounds	2846.10.0000	5.5% ad valorem.
Other rare-earth compounds:		
Oxides or chlorides	2846.90.2000	Free.
Carbonates	2846.90.8000	3.7% ad valorem.
Ferrocerium and other pyrophoric alloys	3606.90.3000	5.9% ad valorem.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth content (domestic), 14% (foreign); bastnäsite and xenotime, 14% (domestic and foreign).

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Government Stockpile:⁷ In the addition to the materials listed below, the FY 2021 and FY 2022 potential acquisitions include neodymium, 600 tons; praseodymium, 70 tons; and samarium-cobalt alloy, 50 tons.

<u>Material</u>	<u>Inventory as of 9–30–21</u>	<u>FY 2021</u>		<u>FY 2022</u>	
		<u>Potential acquisitions</u>	<u>Potential disposals</u>	<u>Potential acquisitions</u>	<u>Potential disposals</u>
Cerium	—	500	—	550	—
Dysprosium	0.2	20	—	20	—
Europium	27.7	—	—	—	—
Ferrodysprosium	0.5	—	—	—	—
Lanthanum	—	1,300	—	1,300	—
Rare-earth-magnet block	—	100	—	100	—
Yttrium	25	600	—	25	—

Events, Trends, and Issues: Global mine production was estimated to have increased to 280,000 tons of REO equivalent. According to China’s Ministry of Industry and Information Technology, the mine production quota for 2021 was 168,000 tons with 148,850 tons allocated to light rare earths and 19,150 tons to ion-adsorption clays.

World Mine Production and Reserves: Reserves for Australia, Russia, the United States, and “Other countries” were revised based on information from Government and industry reports.

	<u>Mine production</u>		<u>Reserves⁸</u>
	<u>2020</u>	<u>2021^e</u>	
United States	39,000	43,000	1,800,000
Australia	21,000	22,000	⁹ 4,000,000
Brazil	600	500	21,000,000
Burma	31,000	26,000	NA
Burundi	300	100	NA
Canada	—	—	830,000
China	¹⁰ 140,000	¹⁰ 168,000	44,000,000
Greenland	—	—	1,500,000
India	2,900	2,900	6,900,000
Madagascar	2,800	3,200	NA
Russia	2,700	2,700	21,000,000
South Africa	—	—	790,000
Tanzania	—	—	890,000
Thailand	3,600	8,000	NA
Vietnam	700	400	22,000,000
Other countries	<u>100</u>	<u>300</u>	<u>280,000</u>
World total (rounded)	<u>240,000</u>	<u>280,000</u>	<u>120,000,000</u>

World Resources:⁸ Rare earths are relatively abundant in the Earth’s crust, but minable concentrations are less common than for most other mineral commodities. In North America, measured and indicated resources of rare earths were estimated to include 2.4 million tons in the United States and more than 15 million tons in Canada.

Substitutes: Substitutes are available for many applications but generally are less effective.

^eEstimated. E Net exporter. NA Not available. XX Not applicable. — Zero.

¹Data include lanthanides and yttrium but exclude most scandium. See also Scandium and Yttrium.

²REO equivalent or content of various materials were estimated. Source: U.S. Census Bureau.

³Defined as production + imports – exports.

⁴Source: Argus Media group—Argus Metals International.

⁵Defined as imports – exports.

⁶In 2018–2020, all domestic production of mineral concentrates was exported or held in inventory, and all compounds and metals consumed were assumed to be imported material.

⁷Gross weight. See Appendix B for definitions.

⁸See Appendix C for resource and reserve definitions and information concerning data sources.

⁹For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 3.0 million tons.

¹⁰Production quota; does not include undocumented production.