

RARE EARTHS¹

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

Domestic Production and Use: Rare earths were not mined domestically in 2017. Bastnaesite, a rare-earth fluorocarbonate mineral, was previously mined as a primary product at Mountain Pass, CA, which was put on care-and-maintenance status in the fourth quarter of 2015. The estimated value of rare-earth compounds and metals imported by the United States in 2017 was \$150 million, a significant increase from \$118 million imported in 2016. The estimated distribution of rare earths by end use was as follows: catalysts, 55%; ceramics and glass, 15%; metallurgical applications and alloys, 10%; polishing, 5%; and other, 15%.

Salient Statistics—United States:	2013	2014	2015	2016	2017^e
Production, bastnaesite concentrates	5,500	5,400	5,900	—	—
Imports: ²					
Compounds:					
Cerium compounds	1,110	2,990	1,440	1,830	2,700
Other rare-earth compounds	7,330	9,260	7,720	9,650	9,300
Metals:					
Ferrocerium, alloys	313	371	356	269	290
Rare-earth metals, scandium, and yttrium	393	348	385	404	400
Exports: ²					
Compounds:					
Cerium compounds	734	608	440	309	220
Other rare-earth compounds	5,570	3,780	4,540	281	420
Metals:					
Ferrocerium, alloys	1,420	1,640	1,220	943	1,300
Rare-earth metals, scandium, and yttrium	1,050	140	60	103	140
Consumption, apparent ³	5,870	12,200	9,550	10,500	11,000
Price, dollars per kilogram, yearend ⁴					
Cerium oxide, 99.5% minimum	5–6	4–5	2	2	3
Dysprosium oxide, 99.5% minimum	440–490	320–360	215–240	185–193	180–190
Europium oxide, 99.99% minimum	950–1,000	680–730	90–110	62–70	75–80
Lanthanum oxide, 99.5% minimum	6	5	2	2	3
Mischmetal, 65% cerium, 35% lanthanum	9–10	9–10	5–6	5–6	6
Neodymium oxide, 99.5% minimum	65–70	56–60	39–42	38–40	56–59
Terbium oxide, 99.99% minimum	800–850	590–640	410–470	410–425	470–480
Employment, mine and mill, annual average	380	391	351	—	—
Net import reliance ⁵ as a percentage of apparent consumption	6	56	38	100	100

Recycling: Limited quantities, from batteries, permanent magnets, and fluorescent lamps.

Import Sources (2013–16): Rare-earth compounds and metals: China, 78%; Estonia, 6%; France, 4%; Japan, 4%; and other, 8%. Imports of compounds and metals from Estonia, France, and Japan were derived from mineral concentrates produced in China and elsewhere.

Tariff: Item	Number	Normal Trade Relations 12–31–17
Rare-earth metals, scandium, and yttrium, whether or not intermixed or interalloyed	2805.30.0000	5.0% ad val.
Cerium compounds:		
Oxides	2846.10.0010	5.5% ad val.
Other	2846.10.0050	5.5% ad val.
Other rare-earth compounds:		
Lanthanum oxides	2846.90.2005	Free.
Other oxides	2846.90.2040	Free.
Lanthanum carbonates	2846.90.8070	3.7% ad val.
Other carbonates	2846.90.8075	3.7% ad val.
Other rare-earth compounds	2846.90.8090	3.7% ad val.
Ferrocerium and other pyrophoric alloys	3606.90.3000	5.9% ad val.

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

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Government Stockpile: The Defense Logistics Agency's annual materials plan for fiscal year 2018 included a potential acquisition of 0.5 tons of dysprosium, 18 tons of europium, 416 tons of unspecified rare earths, and 10 tons of yttrium oxide.

Stockpile Status—9–30–17⁶

Material	Inventory	Disposal Plan FY 2017	Disposals FY 2017
Dysprosium	0.1	—	—
Europium	—	—	—
Ferrodysprosium, gross weight	0.5	—	—
Yttrium oxide	24.5	—	—

Events, Trends, and Issues: In Nebraska, one company commissioned an operation that produced separated rare-earth oxides from an initial production feedstock material from recycled fluorescent light bulbs. The company planned to ramp up production to 18 tons per month using a proprietary technology. In China, the rare-earth mining production quota for 2017 was set at 105,000 tons, unchanged from that in 2016. The rare-earths industry in China continued its consolidation into six major industrial entities. At midyear, the consolidation and efforts to stem illegal production activity were reported to have bolstered prices of some rare-earth materials; however, by yearend, producers in China were suspending production and lowering prices owing to low demand. Through September 2017, China had exported 39,800 tons of rare-earth materials, a 10% increase compared with exports for the same period in 2016. Global exports of rare-earth compounds from Malaysia, a leading supplier of material sourced outside of China, increased to 15,100 tons through August, a 57% increase compared with year-to-date exports in 2016. Mineral concentrates from Australia are used to produce compounds in Malaysia.

World Mine Production and Reserves:

	Mine production ^e		Reserves ⁷
	2016	2017	
United States	—	—	1,400,000
Australia	15,000	20,000	⁸ 3,400,000
Brazil	2,200	2,000	22,000,000
Canada	—	—	830,000
China	⁹ 105,000	⁹ 105,000	44,000,000
Greenland	—	—	1,500,000
India	1,500	1,500	6,900,000
Malawi	—	—	140,000
Malaysia	300	300	30,000
Russia	2,800	3,000	¹⁰ 18,000,000
South Africa	—	—	860,000
Thailand	1,600	1,600	NA
Vietnam	220	100	22,000,000
World total (rounded)	129,000	130,000	120,000,000

World Resources: Rare earths are relatively abundant in the Earth's crust, but minable concentrations are less common than for most other ores. Resources are primarily in four geologic environments: carbonatites, alkaline igneous systems, ion-adsorption clay deposits, and monazite-xenotime-bearing placer deposits. Carbonatites and placer deposits are the leading sources of production of light rare-earth elements. Ion-adsorption clays are the leading source of production of heavy rare-earth elements.

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

^eEstimated. NA Not available. — 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.

⁴Price range from Argus Media group – Argus Metals International.

⁵Defined as imports – exports.

⁶See [Appendix B](#) for definitions.

⁷See [Appendix C](#) for resource and reserve definitions and information concerning data sources.

⁸For Australia, Joint Ore Reserves Committee-compliant reserves were about 2.1 million tons.

⁹Production quota does not include undocumented production.

¹⁰Reserves and resources in Russia's categories A, B, and C1 were about 27 million tons.