RARE EARTHS[1]

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

Domestic Production and Use: In 2010, rare earths were not mined in the United States; however, rare-earth concentrates previously produced at Mountain Pass, CA, were processed into lanthanum concentrate and didymium (75% neodymium, 25% praseodymium) products. Rare-earth concentrates, intermediate compounds, and individual oxides were available from stocks. The United States continued to be a major consumer, exporter, and importer of rare-earth products in 2010. The estimated value of refined rare earths imported by the United States in 2010 was $161 million, an increase from $113 million imported in 2009. Based on reported data through July 2009, the estimated 2009 distribution of rare earths by end use, in decreasing order, was as follows: chemical catalysts, 22%; metallurgical applications and alloys, 21%; petroleum refining catalysts, 14%; automotive catalytic converters, 13%; glass polishing and ceramics, 9%; rare-earth phosphors for computer monitors, lighting, radar, televisions, and x-ray-intensifying film, 8%; permanent magnets, 7%; electronics, 3%; and other, 3%.

Salient Statistics—United States:	2006	2007	2008	2009	2010[e]
Production, bastnäsite concentrates	—	—	—	—	—
Imports:[2]					
Thorium ore (monazite or various thorium materials)	—	—	—	—	—
Rare-earth metals, alloy	867	784	564	188	250
Cerium compounds	2,590	2,680	2,080	1,500	1,400
Mixed REOs	1,570	2,570	2,390	4,750	4,700
Rare-earth chlorides	2,750	1,610	1,310	411	750
Rare-earth oxides, compounds	10,600	9,900	8,810	5,120	2,800
Ferrocerium, alloys	127	123	125	101	87
Exports:[2]					
Thorium ore (monazite or various thorium materials)	—	1	61	18	1
Rare-earth metals, alloys	733	1,470	1,390	4,920	640
Cerium compounds	2,010	1,470	1,380	840	840
Other rare-earth compounds	2,700	1,300	663	455	600
Ferrocerium, alloys	3,710	3,210	4,490	2,970	2,800
Consumption, apparent (excludes thorium ore)[3]	9,350	10,200	7,410	W	W
Price, dollars per kilogram, yearend:					
Bastnäsite concentrate, REO basis[e]	6.06	6.61	8.82	5.73	6.87
Monazite concentrate, REO basis[e]	0.87	0.87	0.87	0.87	0.87
Mischmetal, metal basis, metric ton quantity[4]	5–6	7–8	8–9	8–9	45–55
Stocks, producer and processor, yearend	W	W	W	W	W
Employment, mine and mill, number at yearend	65	70	100	110	125
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Small quantities, mostly permanent magnet scrap.

Import Sources (2006–09): Rare-earth metals, compounds, etc.: China, 92%; France, 3%; Japan, 2%; Austria, 1%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12-31-10
Thorium ores and concentrates (monazite)	2612.20.0000	Free.
Rare-earth metals, whether or not intermixed or interalloyed	2805.30.0000	5.0% ad val.
Cerium compounds	2846.10.0000	5.5% ad val.
Mixtures of REOs (except cerium oxide)	2846.90.2010	Free.
Mixtures of rare-earth chlorides (except cerium chloride)	2846.90.2050	Free.
Rare-earth compounds, individual REOs (excludes cerium compounds)	2846.90.8000	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); bastnäsite and xenotime, 14% (Domestic and foreign).

Government Stockpile: None.

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RARE EARTHS

Events, Trends, and Issues: Based on apparent consumption derived only from 8 months of trade data, domestic consumption of rare earths in 2010 increased significantly compared with that of 2009. Two of seven rare-earth import categories increased when compared with those of 2009—the categories "Rare-earth metals, alloy" and "Rare-earth chlorides." Owing to declining supply, prices for most rare-earth products increased rapidly in the third quarter of 2010. With improving economic conditions, consumption generally increased for cerium compounds used in automotive catalytic converters and in glass additives and glass-polishing compounds; rare-earth chlorides used in the production of fluid-cracking catalysts for oil refining; rare-earth compounds used in automotive catalytic converters and many other applications; and rare-earth metals and their alloys used in armaments and base-metal alloys. Consumption was stable in lighter flints, permanent magnets, pyrophoric alloys, and superalloys; yttrium compounds used in color televisions and flat-panel displays, electronic thermometers, fiber optics, lasers, and oxygen sensors; and phosphors for color televisions, electronic thermometers, fluorescent lighting, pigments, superconductors, x-ray-intensifying screens, and other applications. The trend appears to be for a continued increase in the use of rare earths in many applications, especially automotive catalytic converters, permanent magnets, and rechargeable batteries for electric and hybrid vehicles.

The rare-earth separation plant at Mountain Pass, CA, resumed operation in 2007 and continued to operate throughout 2010. Bastnäsite concentrates and other rare-earth intermediates and refined products continued to be sold from mine stocks at Mountain Pass. Exploration efforts to develop rare earths projects surged in 2010, and investment and interest increased dramatically. Economic assessments continued in North America at Bear Lodge in Wyoming; Diamond Creek in Idaho; Elk Creek in Nebraska; Hoidas Lake in Saskatchewan, Canada; Lemhi Pass in Idaho-Montana; and Nechalacho (Thor Lake) in Northwest Territories, Canada. Other economic assessments took place in other locations around the world, including Dubbo Zirconia in New South Wales, Australia; Kangankunde in Malawi; Mount Weld in Western Australia, Australia; and Nolans Project in Northern Territory, Australia.

World Mine Production and Reserves: Reserves data for Australia, China, and India were updated based on data from the respective countries.

	Mine production[e]		Reserves[6]
	2009	2010	
United States	—	—	13,000,000
Australia	—	—	1,600,000
Brazil	550	550	48,000
China	129,000	130,000	55,000,000
Commonwealth of Independent States	NA	NA	19,000,000
India	2,700	2,700	3,100,000
Malaysia	350	350	30,000
Other countries	NA	NA	22,000,000
World total (rounded)	133,000	130,000	110,000,000

World Resources: Rare earths are relatively abundant in the Earth's crust, but discovered minable concentrations are less common than for most other ores. U.S. and world resources are contained primarily in bastnäsite and monazite. Bastnäsite deposits in China and the United States constitute the largest percentage of the world's rare-earth economic resources, while monazite deposits in Australia, Brazil, China, India, Malaysia, South Africa, Sri Lanka, Thailand, and the United States constitute the second largest segment. Apatite, cheralite, eudialyte, loparite, phosphorites, rare-earth-bearing (ion adsorption) clays, secondary monazite, spent uranium solutions, and xenotime make up most of the remaining resources. Undiscovered resources are thought to be very large relative to expected demand. A very large resource enriched in heavy rare-earth elements is inferred for phosphorites of the Florida Phosphate District.

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

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Data include lanthanides and yttrium but exclude most scandium. See also Scandium and Yttrium.
[2]REO equivalent or contents of various materials were estimated. Data from U.S. Census Bureau.
[3]Defined as production + imports – exports + adjustments for industry stock changes; for 2007 and 2008, excludes producer stock changes (proprietary), and there were no producer stock changes in 2006.
[4]Price range from Elements—Rare Earths, Specialty Metals and Applied Technology, and Web-based High Tech Materials, Longmont, CO, and Hefa Rare Earth Canada Co. Ltd., Richmond, British Columbia, Canada.
[5]Defined as imports – exports + adjustments for Government and industry stock changes. For 2007 and 2008, excludes producer stock changes (proprietary).
[6]See Appendix C for resource/reserve definitions and information concerning data sources.