

RARE EARTHS¹

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

Domestic Production and Use: Rare earths were not mined domestically in 2006. Bastnäsite, a rare-earth fluocarbonate mineral, was previously mined and processed as a primary product at Mountain Pass, CA. Rare-earth concentrates, intermediate compounds, and individual oxides were available from stocks. The United States continued to be a major exporter and consumer of rare-earth products in 2006. The estimated value of refined rare earths consumed in the United States was more than \$1 billion. Based on final 2005 reported data, the estimated 2005 distribution of rare earths by end use was as follows: automotive catalytic converters, 32%; metallurgical additives and alloys, 21%; glass polishing and ceramics, 14%; rare-earth phosphors for lighting, televisions, computer monitors, radar, and X-ray intensifying film, 10%; petroleum refining catalysts, 8%; permanent magnets, 2%; and other, 13%.

Salient Statistics—United States:	2002	2003	2004	2005	2006^e
Production, bastnäsite concentrates ^e	5,000	—	—	—	—
Imports: ²					
Thorium ore (monazite)	—	—	—	—	—
Rare-earth metals, alloy	1,450	1,130	804	880	947
Cerium compounds	2,540	2,630	1,880	2,170	2,530
Mixed REOs	1,040	2,150	1,660	640	1,570
Rare-earth chlorides	1,800	1,890	1,310	2,670	3,410
Rare-earth oxides, compounds	7,260	10,900	11,400	8,550	10,600
Ferrocerium, alloys	89	111	105	130	140
Exports: ²					
Rare-earth metals, alloys	1,300	1,190	1,010	636	659
Cerium compounds	2,740	1,940	2,280	2,210	2,180
Other rare-earth compounds	1,340	1,450	4,800	2,070	2,760
Ferrocerium, alloys	2,830	2,800	3,720	4,320	3,900
Consumption, apparent	11,000	9,340	5,480	6,030	9,790
Price, dollars per kilogram, yearend:					
Bastnäsite concentrate, REO basis ^e	4.08	4.08	4.08	4.08	4.08
Monazite concentrate, REO basis ³	0.54	0.50	0.59	0.54	0.54
Mischmetal, metal basis, metric ton quantity ⁴	5-6	5-6	5-6	5-6	5-6
Stocks, producer and processor, yearend	W	W	W	W	W
Employment, mine and mill, number	95	90	NA	NA	—
Net import reliance ⁵ as a percentage of apparent consumption	54	100	100	100	100

Recycling: Small quantities, mostly permanent magnet scrap.

Import Sources (2002-05): Rare-earth metals, compounds, etc.: China, 76%; France, 9%; Japan, 4%; Russia, 3%; and other, 8%.

Tariff: Item	Number	Normal Trade Relations 12-31-06
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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Events, Trends, and Issues: Domestic demand for rare earths in 2006 increased overall as rare-earth imports and exports were estimated to be higher than in 2005. Demand increased for cerium compounds used in automotive catalytic converters, glass polishing, and glass additives; rare-earth compounds used in automotive catalytic converters and many other applications; and yttrium compounds used in fiber optics, lasers, oxygen sensors, phosphors for fluorescent lighting, color television, electronic thermometers, X-ray intensifying screens, pigments, superconductors, and other applications. Demand was also higher for mixed rare-earth compounds and for rare-earth metals and their alloys used in permanent magnets, base-metal alloys, superalloys, pyrophoric alloys, lighter flints, and armaments. U.S. demand, however, was lower for rare-earth chlorides used in the production of fluid cracking catalysts used in oil refining. Although the rare-earth separation plant at Mountain Pass, CA, remained on a care-and-maintenance basis, it is expected to resume operations. Bastnäsite concentrates and other rare-earth intermediates and refined products continued to be sold from the mine stocks at Mountain Pass. The trend is for a continued increase in the use of rare earths in many applications, especially automotive catalytic converters, permanent magnets, and rechargeable batteries.

World Mine Production, Reserves, and Reserve Base:

	Mine production ^e		Reserves ⁶	Reserve base ⁶
	2005	2006		
United States	—	—	13,000,000	14,000,000
Australia	—	—	5,200,000	5,800,000
China	119,000	120,000	27,000,000	89,000,000
Commonwealth of Independent States	NA	NA	19,000,000	21,000,000
India	2,700	2,700	1,100,000	1,300,000
Malaysia	750	200	30,000	35,000
Thailand	—	—	NA	NA
Other countries	400	400	22,000,000	23,000,000
World total (rounded)	123,000	123,000	88,000,000	150,000,000

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, secondary monazite, loparite, phosphorites, rare-earth-bearing (ion adsorption) clays, spent uranium solutions, and xenotime make up most of the remaining resources. Undiscovered resources are thought to be very large relative to expected demand.

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

^eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

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

²REO equivalent or contents of various materials were estimated. Data from U.S. Census Bureau.

³Monazite price based on monazite exports from Malaysia for 2002 to 2004, and estimated for 2005 and 2006.

⁴Price range from Elements—Rare Earths, Specialty Metals and Applied Technology, Trade Tech, Denver, CO, and Web-based High Tech Materials, Longmont, CO.

⁵Defined as imports – exports + adjustments for Government and industry stock changes.

⁶See Appendix C for definitions.