

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 2005. 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 2005. The estimated value of refined rare earths consumed in the United States was more than \$1 billion. Based on final 2004 reported data, the estimated 2004 distribution of rare earths by end use was as follows: automotive catalytic converters, 32%; metallurgical additives and alloys, 16%; glass polishing and ceramics, 12%; rare-earth phosphors for lighting, televisions, computer monitors, radar, and X-ray intensifying film, 15%; permanent magnets, 4%; petroleum refining catalysts, 4%; and other, 17%.

Salient Statistics—United States:	2001	2002	2003	2004	2005^e
Production, bastnäsite concentrates ^e	5,000	5,000	—	—	—
Imports: ²					
Thorium ore (monazite)	—	—	—	—	—
Rare-earth metals, alloy	1,420	1,450	1,130	804	945
Cerium compounds	3,850	2,540	2,630	1,880	2,210
Mixed REOs	2,040	1,040	2,150	1,660	753
Rare-earth chlorides	2,590	1,800	1,890	1,310	2,330
Rare-earth oxides, compounds	9,150	7,260	10,900	11,400	9,800
Ferrocerium, alloys	118	89	111	105	142
Exports: ²					
Rare-earth metals, alloys	884	1,300	1,190	1,010	637
Cerium compounds	4,110	2,740	1,940	2,280	2,060
Other rare-earth compounds	1,600	1,340	1,450	4,800	1,450
Ferrocerium, alloys	2,500	2,830	2,800	3,720	4,030
Consumption, apparent	15,100	11,000	9,340	5,480	8,240
Price, dollars per kilogram, yearend:					
Bastnäsite concentrate, REO basis ^e	4.08	4.08	4.08	4.08	4.08
Monazite concentrate, REO basis	0.73	0.73	0.73	0.73	0.73
Mischmetal, metal basis, metric ton quantity ³	5-7	5-6	5-6	5-6	5-6
Stocks, producer and processor, yearend	W	W	W	W	W
Employment, mine and mill, number	90	95	90	NA	NA
Net import reliance ⁴ as a percentage of apparent consumption	67	54	100	100	100

Recycling: Small quantities, mostly permanent magnet scrap.

Import Sources (2001-04): Rare-earth metals, compounds, etc.: China, 76%; France, 14%; Japan, 6%; Austria, 2%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12-31-05
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 2005 was higher overall because of increased demand for rare-earth oxides and other refined rare-earth compounds used in automotive catalytic converters, fiber optics, lasers, oxygen sensors, phosphors for fluorescent lighting, color television, electronic thermometers, and X-ray intensifying screens, pigments, superconductors, and other applications. U.S. demand, however, was higher for cerium compounds used in glass polishing and glass additives, rare-earth chlorides used in the production of fluid cracking catalysts, and rare-earth metals and alloys used in metallurgical applications and permanent magnets. U.S. imports of rare earths decreased in two trade categories, mixed rare-earth oxides and rare-earth compounds. 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 ⁵	Reserve base ⁵
	2004	2005		
United States	—	—	13,000,000	14,000,000
Australia	—	—	5,200,000	5,800,000
China	95,000	98,000	27,000,000	89,000,000
Commonwealth of Independent States	2,000	2,000	19,000,000	21,000,000
India	2,700	2,700	1,100,000	1,300,000
Malaysia	250	250	30,000	35,000
Thailand	2,200	2,200	NA	NA
Other countries	—	—	22,000,000	23,000,000
World total (rounded)	102,000	105,000	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 includes lanthanides and yttrium, but excludes most scandium. See also Scandium and Yttrium.

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

³Price range from Elements—Rare Earths, Specialty Metals and Applied Technology, Trade Tech, Denver, CO, and Web-based High Tech Materials, Longmont, CO.

⁴Defined as imports – exports + adjustments for Government and industry stock changes.

⁵[See Appendix C for definitions.](#)