RARE EARTHS[1]

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

Domestic Production and Use: In 2008, 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 2008. The estimated value of refined rare earths imported by the United States was more than $127 million. Based on final 2007 reported data, the estimated 2007 distribution of rare earths by end use, in decreasing order, was as follows: glass polishing and ceramics, 34%; automotive catalytic converters, 30%; rare-earth phosphors for computer monitors, lighting, radar, televisions, and x-ray-intensifying film, 14%; chemicals and petroleum refining catalysts, 11%; ceramics, 3%; pharmaceuticals and pharmaceutical equipment, 3%; permanent magnets, 2%; metallurgical applications and alloys, 1%; laser and scintillator crystals, 1%; and other, 1%.

Salient Statistics—United States:	2004	2005	2006	2007	2008[e]
Production, bastnäsite concentrates[e]	—	—	—	—	—
Imports:[2]					
Thorium ore (monazite or various thorium materials)	—	—	—	—	—
Rare-earth metals, alloy	804	880	867	784	807
Cerium compounds	1,880	2,170	2,590	2,680	2,180
Mixed REOs	1,660	640	1,570	2,570	2,750
Rare-earth chlorides	1,310	2,670	2,750	1,610	1,570
Rare-earth oxides, compounds	11,400	8,550	10,600	9,900	9,050
Ferrocerium, alloys	105	130	127	123	143
Exports:[2]					
Thorium ore (monazite or various thorium materials)	—	—	—	1	56
Rare-earth metals, alloys	1,010	636	733	1,470	1,580
Cerium compounds	2,280	2,210	2,010	1,470	1,620
Other rare-earth compounds	4,800	2,070	2,700	1,300	642
Ferrocerium, alloys	3,720	4,320	3,710	3,210	2,170
Consumption, apparent	5,480	6,030	9,530	10,200	10,500
Price, dollars per kilogram, yearend:					
Bastnäsite concentrate, REO basis[e]	4.08	5.51	5.51	5.51	8.82
Monazite concentrate, REO basis[3]	0.59	0.54	0.87	0.87	0.87
Mischmetal, metal basis, metric ton quantity[4]	5-6	5-6	5-6	7-8	8-9
Stocks, producer and processor, yearend	W	W	W	W	W
Employment, mine and mill, number at yearend	68	70	55	91	99
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Small quantities, mostly permanent magnet scrap.

Import Sources (2004-07): Rare-earth metals, compounds, etc.: China, 87%; France, 5%; Japan, 4%; Russia, 2%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12-31-08
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: Domestic consumption for rare earths in 2008 increased slightly, based on apparent consumption (derived from 9 months of trade data), although rare-earth imports and exports were estimated to be lower than in 2007. Prices were higher in 2008 than in 2007 for most rare-earth products amid increased consumption and a stable supply. Consumption increased for cerium compounds used in automotive catalytic converters and in glass additives and glass polishing compounds; rare-earth compounds used in automotive catalytic converters and many other applications; 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. Consumption was also higher for mixed rare-earth compounds and for rare-earth metals and their alloys used in armaments, base-metal alloys, lighter flints, permanent magnets, pyrophoric alloys, and superalloys. U.S. consumption, however, was substantially lower for rare-earth chlorides used in the production of fluid cracking catalysts used in oil refining. 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 for electric and hybrid vehicles.

The rare-earth separation plant at Mountain Pass, CA, resumed operations in 2007 and continued to operate in 2008. Bastnäsite concentrates and other rare-earth intermediates and refined products continued to be sold from mine stocks at Mountain Pass. Exploration for rare earths continued strong in 2008, and economic assessments continued at Nolans in Australia, Hoidas Lake and Thor Lake in Canada, and Kangankunde in Malawi, Africa. Removal of overburden at the Mt. Weld rare-earth deposit in Australia commenced in early 2008, and initial mining of the open pit was completed in June, recovering 773,300 t of ore at an average grade of 15.4% REO.

World Mine Production, Reserves, and Reserve Base:

	Mine production[e]		Reserves[6]	Reserve base[6]
	2007	2008		
United States	—	—	13,000,000	14,000,000
Australia	—	—	5,200,000	5,800,000
Brazil	650	650	48,000	84,000
China	120,000	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	380	380	30,000	35,000
Other countries	NA	NA	22,000,000	23,000,000
World total (rounded)	124,000	124,000	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, 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.

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]Monazite price based on monazite exports from Malaysia for 2004, and estimated for 2005 through 2008.
[4]Price range from Elements—Rare Earths, Specialty Metals and Applied Technology, Trade Tech, Denver, CO, 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.
[6]See Appendix C for definitions.