YTTRIUM[1]

[Data in metric tons of yttrium oxide (Y_2O_3) 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 the Mountain Pass Mine in California, which was put on care and maintenance in the fourth quarter of 2015. Yttrium was estimated to represent about 0.12% of the rare-earth elements in the Mountain Pass bastnaesite ore.

The leading end uses of yttrium were in ceramics, metallurgy, and phosphors. In ceramic applications, yttrium compounds were used in abrasives, bearings and seals, high-temperature refractories for continuous-casting nozzles, jet-engine coatings, oxygen sensors in automobile engines, and wear-resistant and corrosion-resistant cutting tools. In metallurgical applications, yttrium was used as a grain-refining additive and as a deoxidizer. Yttrium was used in heating-element alloys, high-temperature superconductors, and superalloys. In electronics, yttrium-iron garnets were components in microwave radar to control high-frequency signals. Yttrium was an important component in yttrium-aluminum-garnet laser crystals used in dental and medical surgical procedures, digital communications, distance and temperature sensing, industrial cutting and welding, nonlinear optics, photochemistry, and photoluminescence. Yttrium was used in phosphor compounds for flat-panel displays and various lighting applications.

Salient Statistics—United States:	2013	2014	2015	2016	2017[e]
Production, mine[2]	NA	NA	NA	—	—
Imports for consumption:					
Yttrium, alloys, compounds, and metal[e, 3]	200	200	360	340	380
Exports, compounds[e, 4]	NA	NA	39	2	2
Consumption, estimated[5]	200	200	300	300	300
Price,[e] dollars:					
Yttrium oxide, per kilogram, minimum 99.999 purity[6]	23–27	15–17	7–8	4	3-4
Yttrium metal, per kilogram, minimum 99.9% purity[6]	60–70	55–65	45–51	34–36	34-35
Net import reliance[2, 7] as a percentage of apparent consumption	>95	>95	>95	100	100

Recycling: Insignificant.

Import Sources (2013–16):[8] Yttrium compounds: China, 71%; Estonia, 12%; Japan, 6%; Germany, 3%; and other, 8%. Nearly all imports of yttrium metal and compounds are derived from mineral concentrates produced in China. Import sources do not include yttrium contained in value-added intermediates and finished products.

Tariff: Item	Number	Normal Trade Relations 12–31–17
Rare-earth metals, unspecified, whether or not intermixed or interalloyed	2805.30.0090	5.0% ad val.
Mixtures of rare-earth oxides containing yttrium or scandium as the predominant metal	2846.90.2015	Free.
Mixtures of rare-earth chlorides containing yttrium or scandium as the predominant metal	2846.90.2082	Free.
Yttrium-bearing materials and compounds containing by weight >19% to <85% Y_2O_3	2846.90.4000	Free.
Other rare-earth compounds, including yttrium and other compounds	2846.90.8000	3.7% ad val.

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

Government Stockpile: In fiscal year (FY) 2017, the Defense Logistics Agency acquired 15.7 tons of yttrium oxide. The FY 2018 National Defense Stockpile Annual Materials Plan included a maximum acquisition of 10 tons of yttrium oxide.

Stockpile Status—9–30–17[9]

Material	Inventory	Disposal Plan FY 2017	Disposals FY 2017
Yttrium oxide	24.5	—	—

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YTTRIUM

Events, Trends, and Issues: China produced most of the world's supply of yttrium, from its weathered clay ion-adsorption ore deposits in the southern Provinces—primarily Fujian, Guangdong, and Jiangxi—and from a lesser number of deposits in Guangxi and Hunan Provinces. Processing was primarily at facilities in Guangdong, Jiangsu, and Jiangxi Provinces.

In 2017, global consumption of yttrium oxide was estimated to be 5,000 to 7,000 tons. Globally, yttrium was mainly consumed in the form of oxide compounds for ceramics and phosphors. Lesser amounts were consumed in electronic devices, lasers, optical glass, and metallurgical applications.

Although global consumption increased, owing to an abundance of supply, prices for yttrium metal and oxide remained nearly unchanged in 2017. According to industry reports, increasing popularity of light-emitting-diode lighting over traditional fluorescent lighting has reduced the consumption of yttrium-based phosphors.

Using China's export codes and preliminary export statistics, yttrium oxide (2846.90.11) exports increased in 2017. During the first 8 months of 2017, China exported 1,460 tons of yttrium oxide, primarily to Japan (50%), Italy (18%), and the United States (12%). China's other year-to-date exports of yttrium included 0.6 tons of yttrium fluoride (2846.90.36), 37 tons of unspecified yttrium compounds (2846.90.96), and 18 tons of yttrium metal (2805.30.17). No exports of yttrium carbonate (2846.90.46) and yttrium chloride (2846.90.26) were reported. China continued efforts to manage its rare-earth industry through industry consolidations, crackdowns on illegal production, and stockpiling.

World Mine Production and Reserves:[10] World production of yttrium oxide was almost entirely from China and was estimated to be less than the available supply of 5,000 to 7,000 tons. Programs to stem the undocumented production of rare earths in China were ongoing. Reserves of yttrium are associated with those of rare earths. Global reserves of yttrium oxide were estimated to be more than 500,000 tons. The leading countries for these reserves included Australia, Brazil, China, India, and the United States. Although reserves may be sufficient to satisfy near-term demand at current rates of production, economics, environmental issues, and permitting and trade restrictions could affect the mining or availability of many of the rare-earth elements, including yttrium.

World Resources: Large resources of yttrium in monazite and xenotime are available worldwide in placer deposits, carbonatites, uranium ores, and weathered clay deposits (ion-adsorption ore). Additional resources of yttrium occur in apatite-magnetite-bearing rocks, deposits of niobium-tantalum minerals, nonplacer monazite-bearing deposits, sedimentary phosphate deposits, and uranium ores.

Substitutes: Substitutes for yttrium are available for some applications but generally are much less effective. In most uses, especially in electronics, lasers, and phosphors, yttrium is generally not subject to substitution by other elements. As a stabilizer in zirconia ceramics, yttrium oxide may be substituted with calcium oxide or magnesium oxide, but the substitutes generally impart lower toughness.

[e]Estimated. NA Not available. — Zero.

[1]See also Rare Earths; trade data for yttrium are included in the data shown for rare earths.

[2]Includes yttrium contained in rare-earth ores and mineral concentrates.

[3]Estimated from Trade Mining LLC shipping records.

[4]Estimated from Harmonized System-based Schedule B code: 2846.90.2015.

[5]Rounded to one significant digit. Yttrium consumed domestically was imported or refined from imported materials.

[6]Free on board China. Source: Argus Media group-Argus Metals International, London, United Kingdom.

[7]Defined as imports – exports. From 2013–15, insufficient data were available to determine exports and were excluded from the calculation.

[8]Includes estimated yttrium oxide equivalent from the following Harmonized Tariff Schedule codes: 2846.90.2015, 2846.90.2082, 2846.90.4000, 2846.90.8050, and 2846.90.8060.

[9]See Appendix B for definitions.

[10]See Appendix C for resource and reserve definitions and information concerning data sources.