SCANDIUM[1]

(Data in metric tons of scandium oxide equivalent unless otherwise noted)

Domestic Production and Use: Domestically, scandium was neither mined nor recovered from process streams or mine tailings in 2022. Scandium was last produced domestically in 1969 primarily from the scandium-yttrium silicate mineral thortveitite and from byproduct leach solutions from uranium operations. Limited capacity to produce ingot and distilled scandium metal existed at facilities in Ames, IA; Tolleson, AZ; and Urbana, IL. The principal uses for scandium in 2022 were in aluminum-scandium alloys and solid oxide fuel cells (SOFCs). Other uses for scandium included ceramics, electronics, lasers, lighting, and radioactive isotopes.

Salient Statistics—United States:	2018	2019	2020	2021	2022[e]
Price, yearend:					
Compounds, dollars per gram:					
Acetate, 99.9% purity, 5-gram lot size[2]	44	45	45	43	46
Chloride, 99.9% purity, 5-gram lot size[2]	125	129	133	137	140
Fluoride, 99.9% purity (99.99% purity in 2022), 1- to 5-gram lot size[3]	206	209	214	216	250
Iodide, 99.999% purity, 5-gram lot size[2]	165	157	161	161	170
Oxide, 99.99% purity, 5-kilogram lot size[4]	4.6	3.9	3.8	2.2	2.1
Metal:					
Scandium, dollars per gram:[2]					
Distilled dendritic, 2-gram lot size	226	233	233	238	260
Ingot, 5-gram lot size	132	134	134	137	150
Scandium-aluminum alloy, dollars per kilogram:[4]					
1-kilogram lot size	360	300	340	350	350
1,000-kilogram lot size	NA	NA	NA	NA	98
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2018–21): Although no definitive data exist listing import sources, imported material was mostly from Europe, China, Japan, and the Philippines.

Tariff: Item	Number	Normal Trade Relations 12–31–22
Rare-earth metals:		
Unspecified, not alloys	2805.30.0050	5% ad valorem.
Unspecified, alloyed	2805.30.0090	5% ad valorem.
Compounds of rare-earth metals:		
Mixtures of oxides of yttrium or scandium as the predominant metal	2846.90.2015	Free.
Mixtures of chlorides of yttrium or scandium as the predominant metal	2846.90.2082	Free.
Mixtures of other rare-earth carbonates, including scandium	2846.90.8075	3.7% ad valorem.
Mixtures of other rare-earth compounds, including scandium	2846.90.8090	3.7% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The global supply and consumption of scandium oxide was estimated to be about 20 to 30 tons per year with a global capacity estimate of 80 tons per year. Scandium was recovered from titanium, zirconium, cobalt, and nickel process streams. China, the Philippines, and Russia were the leading producers. Prices quoted for scandium oxide in the United States in 2022 continued to decrease over a 5-year period.

In the United States, a metallurgical testing program with the goal of production of scandium from the polymetallic Elk Creek project in Nebraska continued, and additional financing for the project was announced. Probable reserves were estimated to be 36 million tons containing 70.2 parts per million (2,600 tons) of scandium. Plans for the project included downstream production of ferroniobium, titanium dioxide, and scandium oxide. At the La Paz Scandium and Rare Earths project in Arizona, efforts were ongoing—metallurgical test work was completed, and drilling continued in 2022.

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SCANDIUM

The Defense Logistics Agency-sponsored Small Business Innovative Research program is supporting business development to produce high-purity scandium from titanium dioxide acid waste and support commercial scale efforts. In September, the Department of Defense through the Defense Manufacturing Community Support Program awarded over $4 million to the Supply Chain of Recovered Elements Consortium (SCORE) to utilize mine and industrial waste to extract scandium which would then go into the domestic aluminum alloys supply chain. Research continued to develop methods for separating scandium from coal and coal byproducts. SOFC sourcing of scandium was expanding beyond China to include Japan and the Philippines.

A global mining and polymetallic metal producer completed commissioning of a 3-ton-per-year nameplate capacity scandium commercial-scale plant at its metallurgical complex in Sorel-Tracy, Quebec, Canada, making it the first North American producer of high-purity scandium oxide that will be used to make an aluminum alloy. High-grade scandium resources in Crater Lake, Quebec, exceed 20 million tons according to a Preliminary Economic Assessment.

In Australia, several polymetallic projects were under development and seeking permitting, financing, and offtake agreements including the Sunrise, Nyngan, and Owendale projects. Sunrise Energy Metals in New South Wales has been granted Major Project Status. Additional exploration began at the Sconi project in Queensland.

In the Philippines, the Taganito high-pressure acid-leach nickel commercial plant is recovering 7 to 8 tons per year of scandium oxide. Scandium oxalate production in 2021 was 16 tons, and production in 2022 through June was 9.7 tons.

In Russia, high-purity scandium oxide was recovered from red mud at an industrial site at the Ural Aluminum Smelter by using new process technology. In Greece, a pilot-scale plant demonstrated scandium extraction from bauxite residue using sulfuric acid leaching and selective-ion recovery producing a concentrate containing 22% scandium by weight.

In China, a large state-owned enterprise in Shanghai had 50 tons per year of scandium oxide production capacity with a long-term plan to increase to 100 tons per year. Another company in Henan Province had a 10-ton-per-year scandium oxide capacity with plans to increase output to 20 tons per year.

World Mine Production and Reserves:[6] No scandium was recovered from mining operations in the United States. As a result of its low concentration, scandium is produced exclusively as a byproduct during processing of various ores or recovered from previously processed tailings or residues. Historically, scandium was produced as byproduct material in China (iron ore, rare earths, titanium, and zirconium), Kazakhstan (uranium), the Philippines (nickel), Russia (apatite and uranium), and Ukraine (uranium). Foreign mine production data for 2021 and 2022 were not available.

World Resources:[6] Resources of scandium were abundant. Scandium's crustal abundance is greater than that of lead. Scandium lacks affinity for the common ore-forming anions; therefore, it is widely dispersed in the lithosphere and forms solid solutions with low concentrations in more than 100 minerals. Scandium resources have been identified in Australia, Canada, China, Finland, Guinea, Kazakhstan, Madagascar, Norway, the Philippines, Russia, South Africa, Ukraine, and the United States.

Substitutes: Titanium and aluminum high-strength alloys as well as carbon-fiber materials may substitute in high-performance scandium-alloy applications. Under certain conditions, light-emitting diodes may displace mercury-vapor high-intensity lamps that contain scandium iodide. In some applications that rely on scandium's unique properties, substitution is not possible.

[e]Estimated.

[1]See also the Rare Earths chapter. Scandium is one of the 17 rare-earth elements.

[2]Source: Alfa Aesar, a part of Thermo Fisher Scientific Inc.

[3]Source: Sigma-Aldrich, a part of MilliporeSigma.

[4]Source: Stanford Materials Corp.

[5]Defined as imports – exports. Quantitative data were not available.

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