

CESIUM

(Data in kilograms of cesium content unless otherwise noted)

Domestic Production and Use: Cesium is obtained from its principal ore mineral, pollucite, which occurs in some zoned pegmatites. Pollucite is not mined in the United States; however, there are occurrences of pollucite in pegmatites in Maine and South Dakota. Pollucite is imported as concentrate from Canada by one company in the United States to produce cesium. Its high density makes cesium ideal as a component in specialty, high-density drilling fluids used throughout the world for oil and gas exploration. The U.S. Naval Observatory, Washington, DC, relies on cesium to maintain the accuracy of its atomic clocks, and the master clock there provides a reference time, available to the public at (202) 762-1401. Cesium atomic clocks are accurate to a few hundred trillionths of a second and used to synchronize the positions of the jets that track returning U.S. space shuttles. The accuracy of cesium atomic clocks is important to global positioning satellites, Internet and cell phone transmissions, and missile guidance systems. Cesium is also used in DNA separation techniques, infrared detectors, night vision devices, photoelectric cells, and traffic controls. Cesium-137, a reactor-produced radioactive isotope of cesium, is used in industrial gauges, mining and geophysical instruments, and for sterilization of food, sewage, and surgical equipment. This isotope may also be used in cancer treatment, specifically brachytherapy, where a cesium-137 source is placed within the cancerous area. Cesium-131, another cesium isotope, is used specifically to treat prostate cancer because of its high initial dose and short half-life.

Salient Statistics—United States: Since the late 1980s, production, consumption, import, and export data for cesium have not been available. Similarly, U.S. consumption and world mine production are unavailable. Cesium is not traded, and therefore no market price is available. Cesium consumption in the United States is small and may amount to only a few thousand kilograms per year. In 2006, one company offered 1-gram ampoules of 99.8% (metals basis) cesium for \$42.50 each and 99.98% (metals basis) cesium for \$55.90. The price for 50 grams of 99.8% (metals basis) cesium was \$558.00, and 100 grams of 99.98% (metals basis) cesium was priced at \$1,534.00.

Recycling: None.

Import Sources (2002-05): Canada is the chief source of cesium ore imported by the United States, and the United States is 100% import reliant.

Tariff: Item	Number	Normal Trade Relations 12-31-06
Alkali metals, other	2805.19.9000	5.5% ad val.
Chlorides, other	2827.39.5000	3.7% ad val.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: The United States is reliant on imports of pollucite concentrate from Canada for its cesium supply and, unless there is a change in the cesium market, such as new or increased end uses, domestic cesium occurrences will remain uneconomic. Applications of cesium metal are limited because of cost and reactivity. Cesium has minimal environmental impact, and there are no human health issues associated with cesium. Its chief use is in specialty, high-density drilling muds, also called cesium formate fluids, for the oil and gas exploration industry. Cesium-131 and cesium-137, isotopes of cesium, have applications in cancer treatment; however, the International Atomic Energy Agency has indicated that cesium-137 and other radioactive materials may be used in radiological dispersion devices or “dirty bombs.”

World Mine Production, Reserves, and Reserve Base: Resource and mine production data on cesium are either limited or not available. The reserves and reserve base are estimated based on occurrences of pollucite that are mined as a byproduct with the lithium mineral lepidolite, which is another mineral found in pegmatites. Granitic rocks with exceptionally large crystals are classified as pegmatites. Pollucite is a hydrated aluminosilicate mineral that may form in association with lithium-rich, lepidolite-bearing or petalite-bearing zoned pegmatites. Concentrates of pollucite may contain about 20% cesium by weight. The Canadian deposit at Lac du Bonnet, Canada, which also contains tantalum, contains approximately 300,000 tons of pollucite that grades 24% Cs₂O. The next largest deposit thought to be potentially economic is in Zimbabwe.

	Reserves¹	Reserve base¹
Canada	70,000,000	73,000,000
Namibia	—	9,000,000
Zimbabwe	—	23,000,000
Other countries	<u>NA</u>	<u>NA</u>
World total (rounded)	70,000,000	110,000,000

World Resources: World resources of cesium have not been estimated. Cesium may be associated with lithium-bearing pegmatites worldwide, and cesium resources have been identified in Namibia and Zimbabwe. Cesium occurrences are also known in brines in Chile and China and in geothermal systems in Germany, India, and Tibet.

Substitutes: Cesium and rubidium may be used interchangeably in many applications because of similar physical properties, proximity on the Periodic Table, and similar atomic radii.

NA Not available. — Zero.

[¹See Appendix C for definitions.](#)