RUBIDIUM

(Data in metric tons of rubidium oxide unless otherwise noted)

Domestic Production and Use: In 2020, no rubidium was mined in the United States; however, occurrences of rubidium-bearing minerals are known in Alaska, Arizona, Idaho, Maine, South Dakota, and Utah. Rubidium is also associated with some evaporate mineral occurrences in other States. Rubidium is not a major constituent of any mineral. Rubidium concentrate is produced as a byproduct of pollucite (cesium) and lepidolite (lithium) mining and is imported from other countries for processing in the United States.

Applications for rubidium and its compounds include biomedical research, electronics, specialty glass, and pyrotechnics. Specialty glasses are the leading market for rubidium; rubidium carbonate is used to reduce electrical conductivity, which improves stability and durability in fiber optic telecommunications networks. Biomedical applications include rubidium salts used in antishock agents and the treatment of epilepsy and thyroid disorder; rubidium-82, a radioactive isotope used as a blood-flow tracer in positron emission tomographic imaging; and rubidium chloride, used as an antidepressant. Rubidium atoms are used in academic research, including the development of quantum-mechanics-based computing devices, a future application with potential for relatively high consumption of rubidium. Quantum computing research uses ultracold rubidium atoms in a variety of applications. Quantum computers, which have the ability to perform more complex computational tasks than traditional computers by calculating in two quantum states simultaneously, were expected to be in prototype phase within 10 years.

Rubidium's photoemissive properties make it useful for electrical-signal generators in motion-sensor devices, night-vision devices, photoelectric cells (solar panels), and photomultiplier tubes. Rubidium is used as an atomic resonance-frequency-reference oscillator for telecommunications network synchronization, playing a vital role in global positioning systems. Rubidium-rich feldspars are used in ceramic applications for spark plugs and electrical insulators because of their high dielectric constant. Rubidium hydroxide is used in fireworks to oxidize mixtures of other elements and produce violet hues. The U.S. military frequency standard, the United States Naval Observatory (USNO) timescale, is based on 48 weighted atomic clocks, including 4 USNO rubidium fountain clocks.

Salient Statistics—United States: Consumption, export, and import data are not available. Some concentrate was imported to the United States for further processing. Industry information during the past decade suggests a domestic consumption rate of approximately 2,000 kilograms per year. The United States was 100% import reliant for rubidium minerals.

In 2020, one company offered 1-gram ampoules of 99.75%-grade rubidium (metal basis) for $89.00, a slight increase from $87.80 in 2019, and 100-gram ampoules of the same material for $1,608.00, a slight increase from $1,592.00 in 2019. The price for 1-gram ampoules of 99.8% rubidium formate hydrate (metal basis) was $34.70, unchanged from 2019.

In 2020, the prices for 10 grams of 99.8% (metal basis) rubidium acetate, rubidium bromide, rubidium carbonate, rubidium chloride, and rubidium nitrate were $50.60, $67.00, $56.80, $61.30, and $47.20, respectively. The price for a rubidium-plasma standard solution (10,000 micrograms per milliliter) was $49.50 for 50 milliliters and $80.80 for 100 milliliters, a 5% decrease, each, from those of 2019.

Recycling: None.

Import Sources (2016–19): No reliable data have been available to determine the source of rubidium ore imported by the United States since 1988. Prior to 2016, Canada was thought to be the primary supplier of rubidium ore.

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RUBIDIUM

Tariff: Item	Number	Normal Trade Relations 12–31–20
Alkali metals, other	2805.19.9000	5.5% ad val.
Chlorides, other	2827.39.9000	3.7% ad val.
Bromides, other	2827.59.5100	3.6% ad val.
Iodides, other	2827.60.5100	4.2% ad val.
Sulfates, other	2833.29.5100	3.7% ad val.
Nitrates, other	2834.29.5100	3.5% ad val.
Carbonates, other	2836.99.5000	3.7% ad val.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic rubidium occurrences will remain uneconomic unless market conditions change, such as the development of new end uses or increased consumption for existing end uses, which in turn could lead to increased prices. No known human health issues are associated with exposure to naturally occurring rubidium, and its use has minimal environmental impact.

During 2020, no rubidium production was reported globally. Production of rubidium from all countries, excluding China, ceased within the past two decades. Production in Namibia ceased in the early 2000s, followed by the Tanco Mine in Canada shutting down and later being sold after a mine collapse in 2015. The Bikita Mine in Zimbabwe was depleted of pollucite ore reserves in 2018, and the Sinclair Mine in Australia completed the mining and shipments of all economically recoverable pollucite ore in 2019. Recent reports indicate that with current processing rates, the world's stockpiles of rubidium ore, excluding those in China, will be depleted by 2022.

The primary processing plant of rubidium compounds globally, located in Germany, has reportedly operated far below capacity for the past few years. A company completed an updated mineral resource estimate for the Karibib project in Namibia, reporting 8.9 million metric tons of measured and indicated resources containing 0.23% rubidium and 302 parts per million cesium. Located in the Karibib Pegmatite Belt, lithium would be the primary product, with cesium, potassium, and rubidium as potential byproducts.

World Mine Production and Reserves:[1] There were no official sources for rubidium production data in 2020. Lepidolite and pollucite, the principal rubidium-containing minerals in global rubidium reserves, can contain up to 3.5% and 1.5% rubidium oxide, respectively. Rubidium-bearing mineral resources are found in zoned pegmatites. Mineral resources exist globally, but extraction and concentration are mostly cost prohibitive. No reliable data are available to determine reserves for specific countries; however, Australia, Canada, China, Namibia, and Zimbabwe were thought to have reserves totaling less than 200,000 tons.

World Resources:[1] Significant rubidium-bearing pegmatite occurrences have been identified in Afghanistan, Australia, Canada, China, Denmark, Germany, Japan, Kazakhstan, Namibia, Peru, Russia, the United Kingdom, the United States, and Zambia. Minor quantities of rubidium are reported in brines in northern Chile and China and in evaporites in the United States (New Mexico and Utah), France, and Germany.

Substitutes: Rubidium and cesium can be used interchangeably in many applications because they have similar physical properties and atomic radii. Cesium, however, is more electropositive than rubidium, making it a preferred material for some applications.

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