

## STRONTIUM

(Data in metric tons, strontium content, unless otherwise specified)

**Domestic Production and Use:** Domestic apparent consumption of strontium compounds and minerals decreased by 23% in 2024 compared with that in 2023. The apparent consumption of strontium compounds increased by 22%, but apparent consumption of the strontium mineral celestite decreased by 95%. Although deposits of strontium minerals occur widely throughout the United States, none have been mined since 1959. Large-scale domestic production of strontium carbonate, the principal strontium compound, ceased in 2006. Virtually all the strontium mineral celestite consumed in the United States since 2006 is estimated to have been used as an additive in drilling fluids for oil and natural-gas wells. A few domestic companies manufactured and (or) distributed small quantities of downstream strontium chemicals from imported strontium carbonate.

Based on import data, the estimated end-use distribution in the United States for strontium, including celestite and strontium compounds, was ceramic ferrite magnets, 40%; pyrotechnics and signals, 40%; drilling fluids, 2%; and other uses, including electrolytic production of zinc, glass, master alloys, and pigments and fillers, 18%.

### **Salient Statistics—United States:**

	<b><u>2020</u></b>	<b><u>2021</u></b>	<b><u>2022</u></b>	<b><u>2023</u></b>	<b><u>2024<sup>e</sup></u></b>
Production	—	—	—	—	—
Imports for consumption:					
Celestite <sup>1</sup>	1,060	106	9,160	2,060	100
Strontium compounds <sup>2</sup>	4,440	5,020	5,740	3,330	4,000
Exports, strontium compounds <sup>3</sup>	32	6	15	53	3
Consumption, apparent: <sup>4</sup>					
Celestite	1,060	106	9,160	2,060	100
Strontium compounds	<u>4,410</u>	<u>5,010</u>	<u>5,720</u>	<u>3,270</u>	<u>4,000</u>
Total	5,470	5,120	14,900	5,330	4,100
Price, average unit value of celestite imports at port of exportation, dollars per ton	90	210	143	82	390
Net import reliance <sup>4</sup> as a percentage of apparent consumption	100	100	100	100	100

**Recycling:** None.

**Import Sources (2020–23):** Celestite: Mexico, 100%. Strontium compounds: Germany, 49%; Mexico, 43%; China, 3%; and other, 5%. Total imports: Mexico, 65%; Germany, 30%; and other, 5%.

<b><u>Tariff:</u></b>	<b><u>Item</u></b>	<b><u>Number</u></b>	<b><u>Normal Trade Relations</u></b> <b><u>12–31–24</u></b>
	Celestite	2530.90.8010	Free.
	Strontium compounds:		
	Strontium metal	2805.19.1000	3.7% ad valorem.
	Strontium oxide, hydroxide, peroxide	2816.40.1000	4.2% ad valorem.
	Strontium nitrate	2834.29.2000	4.2% ad valorem.
	Strontium carbonate	2836.92.0000	4.2% ad valorem.

**Depletion Allowance:** 22% (domestic), 14% (foreign).

**Government Stockpile:** None.

**Events, Trends, and Issues:** Imports of celestite in 2024 decreased by 95% compared with those in 2023, likely the result of decreased use in natural-gas- and oil-well-drilling fluids and consumption of stockpiled celestite imported in prior years. The weekly average active rig count<sup>5</sup> decreased by 15% in the first 9 months in 2024 compared with that in the same period in 2023 and remained 39% lower than that in the same period in 2019 before the global coronavirus disease 2019 (COVID-19) pandemic in 2020. In recent years, nearly all celestite imports were from Mexico and were estimated to be used as additives in drilling fluids for oil and natural gas exploration and production. Substitution of celestite by barite may also have contributed to decreased imports because barite is preferred over celestite for drilling mud. For these applications, celestite is ground but undergoes no chemical processing. A small quantity of high-value celestite imports were reported; these were most likely mineral specimens. Celestite is the raw material from which strontium carbonate and other strontium compounds are produced.

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Imports of strontium compounds were estimated to have increased by 20% in 2024. Strontium carbonate is the most traded strontium compound and is used as the raw material from which other strontium compounds are derived. Strontium carbonate is sintered with iron oxide to produce permanent ceramic ferrite magnets. Strontium nitrate, the second most traded strontium compound, contributes a brilliant red color to fireworks and signal flares, including low-noise fireworks. Smaller quantities of these and other strontium compounds and strontium metal were consumed in several other applications, including electrolytic production of zinc, glass production, master alloys, and pigments and fillers. Various novel applications of strontium, such as its use in medical and technological applications, as well as in ultraprecise atomic optical clocks, continue to be researched. In 2024, a strontium atomic clock was recognized as the most accurate timepiece to date. Also in 2024, three of the oldest stars in the universe were identified through low amounts of strontium and barium in their spectra.

In February 2024, the U.S. Department of Defense announced results of a funding opportunity under the Defense Production Act Investments program to establish domestic manufacturing for 22 critical chemicals. A company in Louisiana and a company in Ohio were selected for the domestic production of strontium nitrate, strontium oxalate, and strontium peroxide, among other chemicals. These awards were expected to improve the domestic supply chain, modernize manufacturing capacity, and lead to new jobs.

## World Mine Production and Reserves:<sup>6</sup>

	Mine production <sup>e</sup>		Reserves <sup>7</sup>
	2023	2024	
United States	—	—	NA
Argentina	700	700	NA
China	80,000	80,000	12,000,000
Iran	200,000	200,000	7,100,000
Mexico	<sup>8</sup> 28,000	25,000	NA
Spain	<u>200,000</u>	<u>200,000</u>	<u>NA</u>
World total (rounded)	509,000	510,000	Large

## World Resources:<sup>7</sup> World resources of strontium may exceed 1 billion tons.

**Substitutes:** Barium can be substituted for strontium in ceramic ferrite magnets; however, the resulting barium composite will have a reduced maximum operating temperature when compared with that of strontium composites. Substituting for strontium in pyrotechnics is hindered by difficulty in obtaining the desired brilliance and visibility imparted by strontium and its compounds. In drilling mud, barite is the preferred material, but celestite may substitute for some barite, especially when barite prices are high.

<sup>e</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>The strontium content of celestite ore is 43.88%, which was used to convert units of gross weight celestite ore to strontium content.

<sup>2</sup>Strontium compounds (with their respective strontium contents) include metal (100%); oxide, hydroxide, and peroxide (70%); carbonate (59.35%); and nitrate (41.40%). These factors were used to convert gross weight of strontium compounds to strontium content.

<sup>3</sup>Calculated from Schedule B number 2836.92.0000 for strontium carbonate. Other strontium compounds exports are not included because these shipments likely consisted of materials misclassified as strontium compounds.

<sup>4</sup>Defined as imports – exports.

<sup>5</sup>Source: Baker Hughes Co., 2024, Rig count overview & summary count: Baker Hughes Co. (Accessed October 17, 2024, at <https://rigcount.bakerhughes.com/na-rig-count>.)

<sup>6</sup>Gross weight of celestite in tons.

<sup>7</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>8</sup>Reported.