

STRONTIUM

(Data in metric tons of contained strontium unless otherwise noted)

Domestic Production and Use: Although deposits of strontium minerals occur widely throughout the United States, none have been mined in the United States since 1959. 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 thought to have been used as an additive in drilling fluids for oil and natural gas wells. A few domestic companies produced 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 and pyrotechnics and signals, 40% each; and other uses, including drilling fluids, electrolytic production of zinc, master alloys, pigments and fillers, and other applications, including glass accounted for the remaining 20%.

<u>Salient Statistics—United States:</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021^e</u>
Production	—	—	—	—	—
Imports for consumption:					
Celestite ¹	11,300	16,900	7,960	1,060	—
Strontium compounds ²	6,660	6,350	5,560	4,440	4,800
Exports, strontium compounds	36	32	20	32	12
Consumption, apparent: ³					
Celestite	11,300	16,900	7,960	1,060	—
Strontium compounds	<u>6,620</u>	<u>6,320</u>	<u>5,540</u>	<u>4,410</u>	<u>4,800</u>
Total	17,900	23,200	13,500	5,470	4,800
Price, average value of celestite imports at port of exportation, dollars per ton	74	78	82	90	XX
Net import reliance ³ as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2017–20): Celestite: Mexico, 100%. Strontium compounds: Mexico, 47%; Germany, 43%; China, 5%; and other, 5%. Total imports: Mexico, 80%; Germany, 16%; China, 2%; and other, 2%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u> <u>12–31–21</u>
	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: Apparent consumption of total strontium declined by 12% in 2021. Apparent consumption of strontium compounds increased by 9%, but apparent consumption of celestite decreased by 100% to zero. Following a 59% decrease of apparent consumption of all forms of strontium in 2020 because of the economic downturn caused by restrictions imposed worldwide as the result of the global COVID-19 pandemic, consumption of strontium compounds increased as the economy began to recover in 2021. World celestite production was estimated to have increased slightly from that of 2020.

On November 9, 2021, a proposed revised U.S. critical minerals list was published in the Federal Register (86 FR 62199). The new list contained 50 individual mineral commodities; proposed changes were the addition of nickel and zinc and the removal of helium, potash, rhenium, strontium, and uranium, which were included in the 2018 critical minerals list.

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No imports of celestite, the most commonly used strontium mineral, were reported in 2021, likely the result of decreased use of celestite in natural-gas- and oil-well-drilling fluids. Although drilling activity increased in 2021, it remained very low compared with that seen in the few years before the pandemic. In recent years, nearly all celestite imports were from Mexico and were thought to be used as additives in drilling fluids for oil and natural gas exploration and production. 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. Although no strontium carbonate was produced in the United States, celestite is the raw material from which strontium carbonate and other strontium compounds are produced.

Strontium carbonate is the most commonly 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, and strontium nitrate contributes a brilliant red color to fireworks and signal flares. Smaller quantities of these and other strontium compounds were consumed in several other applications, including electrolytic production of zinc, glass production, master alloys, and pigments and fillers. Imports of strontium compounds were estimated to have increased by 8% in 2021.

World Mine Production and Reserves:⁴

	Mine production		Reserves⁵
	<u>2020</u>	<u>2021^e</u>	
United States	—	—	Quantitative estimates of reserves for most countries were not available.
Argentina	^e 700	700	
China	^e 80,000	80,000	
Iran	^e 90,000	90,000	
Mexico	33,500	35,000	
Spain	<u>^e150,000</u>	<u>150,000</u>	
World total (rounded)	<u>^e350,000</u>	<u>360,000</u>	

World Resources:⁵ World resources of strontium are thought to exceed 1 billion tons.

Substitutes: Barium can be substituted for strontium in ferrite ceramic 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.

^eEstimated. XX Not applicable. — Zero.

¹The strontium content of celestite is 43.88%, assuming an ore grade of 92%, which was used to convert units of celestite to strontium content.

²Strontium compounds, with their respective strontium contents, in descending order, include metal (100.00%); oxide, hydroxide, and peroxide (70.00%); carbonate (59.35%); and nitrate (41.40%). These factors were used to convert gross weight of strontium compounds to strontium content.

³Defined as imports – exports.

⁴Gross weight of celestite in tons.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.