

STRONTIUM

(Data in metric tons of strontium content 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. A few domestic companies produce small quantities of downstream strontium chemicals from imported strontium carbonate. The estimated end-use distribution for strontium compounds in the United States was pyrotechnics and signals, 30%; ceramic ferrite magnets, 30%; master alloys, 10%; pigments and fillers, 10%; electrolytic production of zinc, 10%; and other applications, including glass, 10%.

It is thought that virtually all of the strontium mineral celestite consumed in the United States since 2006 has been used as an additive in drilling fluids for oil and natural gas wells.

Salient Statistics—United States:	2012	2013	2014	2015	2016^e
Production	—	—	—	—	—
Imports for consumption:					
Celestite ¹	8,660	21,900	24,200	24,500	3,160
Strontium compounds ²	8,150	7,190	7,600	7,100	7,760
Exports, strontium compounds	71	37	104	86	130
Consumption, apparent:					
Celestite	8,660	21,900	24,200	24,500	3,160
Strontium compounds	8,070	7,160	7,500	7,020	7,630
Total	16,700	29,000	31,700	31,500	10,800
Price, average value of celestite imports at port of exportation, dollars per ton	50	50	50	51	70
Net import reliance ³ as a percentage of apparent consumption	100	100	100	100	100

Recycling: None.

Import Sources (2012–15): Celestite: Mexico, 100%. Strontium compounds: Mexico, 55%; Germany, 28%; China, 14%; and other, 3%. Total imports: Mexico, 62%; Germany, 24%; China, 12%; and other, 2%.

Tariff:	Item	Number	Normal Trade Relations
			12–31–16
			Free.
	Celestite	2530.90.8010	
	Strontium compounds:		
	Strontium metal	2805.19.1000	3.7% ad val.
	Strontium oxide, hydroxide, peroxide	2816.40.1000	4.2% ad val.
	Strontium nitrate	2834.29.2000	4.2% ad val.
	Strontium carbonate	2836.92.0000	4.2% ad val.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: None.

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Events, Trends, and Issues: After increasing for 6 consecutive years, imports of celestite, the most commonly used strontium mineral, decreased by about 87% in 2016. The decrease was likely the result of decreased natural gas and oil drilling activity owing to low gas and oil prices. All of the material came from Mexico and is thought to be used exclusively as an additive in drilling fluids for oil and natural gas exploration and production. For these applications, celestite is ground but undergoes no chemical processing. Outside the United States, celestite is the raw material used for production of strontium compounds.

Strontium carbonate is sintered with iron oxide to produce permanent ceramic ferrite magnets. Strontium nitrate contributes a brilliant red color to fireworks and signal flares. Approximately equal quantities of strontium compounds were thought to be used in these end uses. Smaller quantities of strontium compounds were consumed in several other applications, including glass production, electrolytic production of zinc, master alloys, and pigments and fillers. Strontium may be ingested by humans as a dietary supplement, as an active ingredient in toothpastes, and as a pain reliever for some types of cancer. Although specific information is not available, these uses likely consume very small quantities of strontium compounds, but the compounds must be extremely pure and, thus, are of high unit value.

With improvements to global economic conditions, consumption of strontium compounds and, thus, celestite would be expected to increase. Little information is available about the potential for celestite consumption in drilling fluids, but if oil and gas drilling increases, celestite consumption in that end use may increase as well. The current state of oil prices internationally, however, implies that oil and gas drilling will not increase in the immediate future.

In descending order of production, China, Spain, and Mexico are the world's leading producers of celestite. China also is a major importer of celestite.

World Mine Production and Reserves:⁴

	Mine production		Reserves ⁵
	2015	2016 ^e	
United States	—	—	—
Argentina	5,000	5,000	All other:
China	180,000	180,000	6,800,000
Mexico	79,000	77,000	
Spain	<u>90,000</u>	<u>90,000</u>	
World total (rounded)	354,000	350,000	<u>6,800,000</u>

World Resources: 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 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. — 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, include strontium metal (100.00%); oxide, hydroxide, and peroxide (70.00%); carbonate (59.35%); and nitrate (41.40%). These factors were used to convert units 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.