GRAPHITE (NATURAL)

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: Although natural graphite was not produced in the United States in 2016, approximately 98 U.S. firms, primarily in the Northeastern and Great Lakes regions, consumed 24,200 tons valued at $25.6 million. The major uses of natural graphite in 2016 were brake linings, foundry operations, lubricants, refractory applications, and steelmaking. During 2016, U.S. natural graphite imports were 39,500 tons, which were 70% flake and high-purity, 29% amorphous, and 1% lump and chip graphite.

Salient Statistics—United States:	2012	2013	2014	2015	2016[e]
Production, mine	—	—	—	—	—
Imports for consumption	57	61	70	47	39
Exports	8	10	12	12	15
Consumption, apparent[1]	49	51	57	35	24
Price, imports (average dollars per ton at foreign ports):					
Flake	1,370	1,330	1,270	1,480	1,360
Lump and chip (Sri Lankan)	1,960	1,720	1,870	1,800	1,820
Amorphous	339	375	360	394	364
Net import reliance[1] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Refractory brick and linings, alumina-graphite refractories for continuous metal castings, magnesia-graphite refractory brick for basic oxygen and electric arc furnaces, and insulation brick led the way in recycling of graphite products. The market for recycled refractory graphite material is expanding, with material being recycled into products such as brake linings and thermal insulation.

Recovering high-quality flake graphite from steelmaking kish is technically feasible, but not practiced at the present time. The abundance of graphite in the world market inhibits increased recycling efforts. Information on the quantity and value of recycled graphite is not available.

Import Sources (2012–15): China, 34%; Mexico, 33%; Canada, 18%; Brazil, 7%; and other, 8%.

Tariff: Item	Number	Normal Trade Relations 12–31–16
Crystalline flake (not including flake dust)	2504.10.1000	Free.
Powder	2504.10.5000	Free.
Other	2504.90.0000	Free.

Depletion Allowance: 22% (Domestic lump and amorphous), 14% (Domestic flake), and 14% (Foreign).

Government Stockpile: None.

Events, Trends, and Issues: Worldwide consumption of graphite steadily increased since 2012 and into 2016. This increase resulted from the improvement of global economic conditions and its impact on industries that use graphite; however, U.S. consumption of natural graphite has declined from 2014 to 2016.

In 2016, principal U.S. import sources of natural graphite were, in descending order of tonnage, China, Canada, Brazil, Japan, Mexico, and Madagascar, which combined accounted for 96% of the tonnage and 98% of the value of total imports. Mexico provided all the amorphous graphite, and Sri Lanka provided all the lump and chippy dust variety. China, Canada, Brazil, and Madagascar were, in descending order of tonnage, the major suppliers of crystalline flake and flake dust graphite.

During 2016, China produced 66% of the world's graphite and consumed 35%. Graphite production decreased in Canada and increased in Madagascar from that of 2015. New deposits are being developed, and mines will begin production in the near future in Madagascar, Mozambique, Namibia, and Tanzania.

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GRAPHITE (NATURAL)

North America produced only 4% of the world's graphite supply with production in Canada and Mexico. No production of natural graphite was reported in the United States, but two companies recently have been developing graphite projects in the United States. Alabama Graphite Corp. was developing the Coosa Graphite Project in Alabama, and Graphite One Resources Inc. was developing the Graphite Creek Project in Alaska.

One U.S. automaker was building a large plant to manufacture lithium-ion electric vehicle batteries. The plant's completion was originally projected for 2020, but the project is about 2 years ahead of schedule. During July 2016, one-sixth of the plant was completed, and the first batteries were expected to be produced by the end of 2016. When the plant is complete, it will require 93,000 tons of flake graphite to produce 35,200 tons of spherical graphite for use as anode material for lithium-ion batteries.

Advances in thermal technology and acid-leaching techniques that enable the production of higher purity graphite powders are likely to lead to development of new applications for graphite in high-technology fields. Such innovative refining techniques have enabled the use of improved graphite in carbon-graphite composites, electronics, foils, friction materials, and specialty lubricant applications. Flexible graphite product lines, such as graphoil (a thin graphite cloth), are likely to be the fastest growing market. Large-scale fuel-cell applications are being developed that could consume as much graphite as all other uses combined.

World Mine Production and Reserves: The reserves data for Madagascar, Mozambique, and Tanzania were revised based on information reported by graphite-producing companies and the Governments of those countries.

	Mine production		Reserves[2]
	2015	2016[e]	
United States	—	—	—
Brazil	80	80	72,000
Canada	30	21	([3])
China	780	780	55,000
India	170	170	8,000
Korea, North	30	30	([3])
Madagascar	5	8	1,600
Mexico	22	22	3,100
Mozambique	—	—	13,000
Norway	8	8	([3])
Russia	15	15	([3])
Sri Lanka	4	4	([3])
Tanzania	—	—	5,100
Turkey	32	32	90,000
Ukraine	5	5	([3])
Zimbabwe	7	7	([3])
World total (rounded)	1,190	1,200	250,000

World Resources: Domestic resources of graphite are relatively small, but the rest of the world's inferred resources exceed 800 million tons of recoverable graphite.

Substitutes: Synthetic graphite powder, scrap from discarded machined shapes, and calcined petroleum coke compete for use in iron and steel production. Synthetic graphite powder and secondary synthetic graphite from machining graphite shapes compete for use in battery applications. Finely ground coke with olivine is a potential competitor in foundry-facing applications. Molybdenum disulfide competes as a dry lubricant but is more sensitive to oxidizing conditions.

[e]Estimated. — Zero.

[1]Defined as imports – exports.

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

[3]Included with "World total."