GRAPHITE (NATURAL)

(Data in metric tons unless otherwise noted)

Domestic Production and Use: In 2022, natural graphite was not produced in the United States; however, approximately 95 U.S. companies, primarily in the Great Lakes and Northeast regions, consumed 72,000 tons valued at an estimated $140 million. The major uses of natural graphite were batteries, brake linings, lubricants, powdered metals, refractory applications, and steelmaking. During 2022, U.S. natural graphite imports were an estimated 82,000 tons, consisting of about 77% flake and high-purity, 22% amorphous, and 1% lump and chip graphite.

Graphite consumption is expected to continue to increase, owing largely to growth from the electric-vehicle market. The battery end-use market for graphite has grown by 250% globally since 2018. In the United States, 4 lithium-ion battery manufacturing plants are currently in operation, with an additional 21 in development. At full capacity, these plants are expected to require approximately 1.2 million tons per year of spherical purified graphite, with an estimated 40% to 60% coming from synthetic graphite.

Salient Statistics—United States:	2018	2019	2020	2021	2022[e]
Production, mine	—	—	—	—	—
Imports for consumption	70,700	50,100	36,000	53,100	82,000
Exports	9,950	5,890	5,930	8,670	9,600
Consumption, apparent[1]	60,700	44,200	30,000	44,400	72,000
Price, average unit value of imports, dollars per metric ton at foreign ports:					
Flake	1,520	1,340	1,340	1,390	1,300
Lump and chip (Sri Lanka)	1,890	2,380	2,940	2,010	2,500
Amorphous	319	511	567	622	560
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 the recycling of graphite products. Recycling of refractory graphite material is increasing, 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 currently not practiced. 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 (2018–21): China,[5] 33%; Mexico, 18%; Canada, 17%; Madagascar, 10%; and other, 22%.

Tariff: Item	Number	Normal Trade Relations 12–31–22
Crystalline flake (not including flake dust)	2504.10.1000	Free.
Powder	2504.10.5000	Free.
Other	2504.90.0000	Free.

Depletion Allowance: Lump and amorphous, 22% (domestic) and flake, 14% (domestic); 14% (foreign).

Government Stockpile:[2]

		FY 2022		FY 2023	
Material	Inventory as of 9–30–22	Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Graphite	—	900	—	—	—

Events, Trends, and Issues: U.S. natural graphite imports decreased by 29% and 28% in 2019 and 2020, respectively, and then increased by 48% in 2021, and by 55% in 2022. U.S. imports for consumption and U.S. apparent consumption increased by 16% and 19%, respectively, for the 5-year period of 2018 to 2022. The increase in consumption is likely due to rising demand from the lithium-ion battery industry.

In 2022, China was the world's leading graphite producer, producing an estimated 65% of total world production. Approximately 24% of graphite produced in China was amorphous and about 76% was flake. China produced some large flake graphite, but much of its flake graphite production was very small, in the +200-mesh range. China also processed most of the world's spherical graphite.

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GRAPHITE (NATURAL)

North America produced only 1.2% of the world's graphite supply with production in Canada and Mexico. Three companies were developing graphite-mining projects in the United States—two in Alabama and one in Alaska. Two spherical graphite plants were in construction during 2022, located in Kellyton, AL, and Vidalia, LA, with production expected to begin during 2023. In 2022, the Vidalia project was awarded a grant of up to $220 million under the Bipartisan Infrastructure Law towards expanding the production capacity to 45,000 tons per year.

Africa has been a recent focus for graphite exploration, with projects under development in Madagascar, Mozambique, Namibia, and Tanzania. Additional projects were in advanced development stages in Australia, Canada, and Sweden. A Canadian company and an Australian company continued to construct mines in Madagascar and Tanzania, respectively, with production expected to begin by 2023. In 2022, an Australian company commissioned a graphite anode plant in Sweden, becoming the first commercial plant operating in Europe.

In February, Ukraine halted graphite production, citing Russian military action. Operations recommenced in August, although future production was uncertain as the conflict continued. Additionally, the United States and many other countries have suspended normal trade relations with Russia, removing supplies of Russian graphite from much of the global market. Leading up to the conflict, Ukraine and Russia were considered among the top 10 producers of graphite.

World Mine Production and Reserves: Reserves for Brazil, China, and Russia were revised based on company and Government reports.

	Mine production		Reserves[3]
	2021	2022[e]	
United States	—	—	([4])
Austria	500	500	([4])
Brazil	82,000	87,000	74,000,000
Canada	12,000	15,000	([4])
China	820,000	850,000	52,000,000
Germany	250	250	([4])
India	7,000	8,300	8,000,000
Korea, North	8,100	8,100	2,000,000
Korea, Republic of	10,500	17,000	1,800,000
Madagascar	70,000	110,000	26,000,000
Mexico	2,100	1,900	3,100,000
Mozambique	72,000	170,000	25,000,000
Norway	6,290	10,000	600,000
Russia	15,000	15,000	14,000,000
Sri Lanka	3,000	3,000	1,500,000
Tanzania	—	8,000	18,000,000
Turkey	2,700	2,900	90,000,000
Ukraine	10,000	3,000	([4])
Uzbekistan	110	—	7,600,000
Vietnam	5,000	5,000	([4])
World total (rounded)	1,130,000	1,300,000	330,000,000

World Resources:[3] Domestic resources of graphite are relatively small, but the rest of the world's 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 B for definitions.

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

[4]Included in "World total."

[5]Includes Hong Kong.