



2019 Minerals Yearbook

TANTALUM [ADVANCE RELEASE]

TANTALUM

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In 2019, U.S. tantalum apparent consumption (measured in tantalum content) was 957 metric tons (t), slightly less than the revised 975 t in 2018 (table 1). Apparent consumption of tantalum has increased in recent years from less than 600 t in 2015 and 2016 to about 900 t in 2017 to more than 950 t in 2018 and 2019. No domestic mine production of tantalum ore was reported in 2019. The estimated tantalum content of world mine production was 1,850 t, an 8% decrease from revised world production in 2018 (tables 1, 4). The United States imported 1,380 t of tantalum contained in alloys, metals, ores, and concentrates, 17% less than that in 2018 (table 1). In the same period, the United States exported 423 t of tantalum contained in tantalum-bearing metal, alloys, ores, and concentrates, 38% less than that in 2018. Traded tantalum materials included chemicals, potassium hepta-fluorotantalate (commercially known as K-salt), residue, scrap, slag, tantalum metal, and tantalum ores and concentrates. The principal uses of tantalum were in electronic capacitors and in superalloys for aircraft engines and turbines.

K-salt and tantalum oxide (Ta_2O_5) do not have unique Harmonized Tariff Schedule of the United States (HTS) codes. As a result, a potentially significant part of tantalum material trade is undocumented.

Legislation and Government Programs

The Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense, designated a maximum quantity of 1,710 kilograms (kg) of tantalum carbide powder and 86 kg of tantalum scrap for disposal from the National Defense Stockpile under its Annual Materials Plan for fiscal year 2020 (October 1, 2019, to September 30, 2020), and designated a maximum quantity of 15,400 kg of tantalum for potential acquisition (Defense Logistics Agency Strategic Materials, 2019a, b). The stockpile inventory as of September 30, 2019, was 1.71 t of tantalum carbide powder (tantalum content), 84 kg tantalum metal, and 1.5 kg of tantalum alloys (Padilla, 2020).

In July, the U.S. Agency for International Development announced that it had awarded \$3.7 million to the “Sustainable Mine Site Validation” project in Congo (Kinshasa), which was implemented by Pact, a nongovernmental international development organization. The project sought to ensure responsible mineral sourcing in the North and South Kivu Provinces by verifying that no armed groups were present at artisanal mine sites and that the mines had the legal authority to operate (U.S. Embassy Kinshasa, 2019).

Production

Globally, tantalite and columbite-tantalite (also referred to as “coltan”) are the leading minerals mined for tantalum. The primary marketable tantalum materials are tantalum metal

(unwrought and wrought alloys, metal, and powder), ore, and scrap. Tantalum resources in the United States are of low grade, some are mineralogically complex, and most are not commercially recoverable at current prices. As a result, domestic supply has been a concern. In 2019, no domestic tantalum mine production was reported. Recycled materials and stocks were the only domestic supply sources of tantalum. Companies in the United States produced tantalum alloys, compounds, and metal from imported tantalum-containing materials and from foreign and domestic scrap, but the available information was inadequate for a reliable estimate of output. World tantalum resources and mining capacity were concentrated in Australia, Brazil, Canada, China, Congo (Kinshasa), Nigeria, and Rwanda. Current world tantalum reserves are adequate to meet anticipated global consumption.

Consumption

Domestic consumption data for tantalum materials were developed by the USGS by means of the “Columbium (Niobium) and Tantalum,” “Consolidated Consumers,” and “Specialty Ferroalloys” surveys. For tantalum materials, no consumers responded to the “Columbium (Niobium) and Tantalum” canvass, 16 responded to the “Consolidated Consumers” canvass, and 1 responded to the “Specialty Ferroalloys” canvass.

U.S. apparent domestic consumption of tantalum was 957 t in 2019, slightly less than that in 2018, but still more than annual apparent consumption in 2015 and 2016, when it was less than 600 t. Imports of all reported categories of tantalum materials, including ores and concentrates, unwrought and wrought metal, and waste and scrap, decreased in 2019 compared with their respective import quantities in 2018 (tables 1, 2).

Yageo Corp. (Taiwan) entered into a definitive agreement to acquire United States-based tantalum capacitor producer KEMET Corp. (Fort Lauderdale, FL) in November. KEMET owned 23 manufacturing facilities in 22 countries and produced other high-end electronic components including ceramic capacitors, film and electrolytic capacitors, and magnetic actuators and sensors (KEMET Corp., 2019).

Foreign Trade

Tantalum material exports from and imports to the United States included tantalum metal, ores, powders, and waste and scrap. Trade of K-salt and tantalum oxide was not documented owing to the lack of unique HTS codes for these materials. According to the U.S. Census Bureau, in 2019 the United States exported tantalum materials valued at \$157 million, 20% less than that in 2018, and imported tantalum materials valued at \$258 million, a decrease of 21% compared with that in 2018 (table 2). In 2019, Australia replaced Rwanda

as the leading supplier of tantalum ores and concentrates, accounting for more than one-half of imports (table 3). China continued to be the leading supplier of tantalum metal (wrought and unwrought) and Germany was the leading supplier of tantalum metal powders. Indonesia was the leading supplier of waste and scrap imports. China was the leading destination of United States exported synthetic concentrates and was the leading destination of wrought products. Waste and scrap were predominantly exported to Kazakhstan; Mexico was the leading destination of exported unwrought tantalum metal and metal powders (table 2).

Prices

Tantalum materials were not openly traded. Purchase contracts were confidential between buyer and seller; however, trade journals reported composite prices of tantalite based on interviews with buyers and sellers and traders declared the value of tantalum materials that they imported or exported. In 2019, the annual average price of tantalite ore decreased to \$161 per kilogram of Ta₂O₅ content, 25% less than that in 2018 (table 1).

Based on U.S. Census Bureau data, in 2019 the average unit value (gross weight basis) of tantalum materials imported to the United States was \$287 per kilogram for metal and powders; \$51 per kilogram for ores and concentrates, including synthetic concentrates; and \$58 per kilogram for tantalum waste and scrap. The average price of exported tantalum materials was \$403 per kilogram for unwrought metal and metal powders, \$727 per kilogram for wrought metal, and \$121 per kilogram for tantalum waste and scrap (table 2).

World Review

In 2019, estimated world production of tantalum contained in cassiterite, columbite-tantalite, loparite, and tantalite concentrates was 1,850 t (table 4), an 8% decrease compared with 2,020 t in 2018. Congo (Kinshasa), Brazil, and Rwanda were the leading producers of tantalum mineral concentrates, in descending order of quantity. Tantalum-bearing tin slags, which are byproducts from tin smelting, principally from Asia, Australia, and Brazil, were another source of tantalum. Tantalum product shipments (including tantalum capacitor-grade powder, carbide, chemicals, ingot, metallurgical-grade powder, and mill products) by tantalum processors were reported to have decreased by 17% in 2019 compared with shipments in 2018. Decreased shipments of tantalum mill products (by 71%) and capacitor-grade powder (by 38%) accounted for most of the overall decrease (Tantalum-Niobium International Study Center, 2021, p. 28–29). According to Roskill Information Services Ltd. (2020), the electronics industry accounted for about one-half of global tantalum consumption in the form of tantalum capacitors and sputtering targets.

Australia.—Although tantalum production in Australia increased in 2019 compared with that in 2018, some lithium mines that produced byproduct tantalum decreased or stopped production later in the year as a result of decreasing lithium prices. Lithium prices were reported to have decreased during 2019 because of increased supply alongside a decrease in demand after China reduced its subsidies for electric vehicles (Shi, 2019, 2020).

The Bald Hill lithium-tantalum mine in Western Australia was put on care-and-maintenance status in September during a period of decreasing lithium prices. The mine was owned by Alita Resources Ltd. (formerly known as Alliance Minerals Assets Ltd.), which suspended securities trading in August. Galaxy Resources Ltd. later acquired Alita Resources' debts. The Bald Hill Mine began commercial production of lithium and byproduct tantalum concentrates in mid-2018. Alita Resources had offtake agreements to sell high-grade tantalum concentrates to H.C. Starck GmbH (Germany) and lithium concentrates to Jinagxi Bao Jiang Lithium Industrial Ltd. (China), and a one-off sales contract to sell 400 t of low-grade tantalum concentrates to Global Advanced Metals Resources Greenbushes Pty Ltd. (Iannucci, 2018; Facada, 2019; Mir, 2019).

Pilbara Minerals Ltd. announced that it had decreased production at the Pilgangoora lithium-tantalum mine in Western Australia in the second half of 2019 in response to decreasing demand for lithium raw materials, particularly in China (Pilbara Minerals Ltd., 2020, p. 3).

Brazil.—Mineração Taboca S.A. [a subsidiary of MINSUR S.A. (Peru)] operated the open pit Pitinga-Pirapora tin-tantalum-niobium mine complex in Amazonas State. The company previously reported that it produced 3,980 t in gross weight of niobium and tantalum ferroalloys with an average combined niobium and tantalum content of 59% in 2018 (MINSUR S.A., 2019, p. 28). By yearend 2020, tantalum production at the mine had not been reported for 2019.

AMG Advanced Metallurgical Group NV (Netherlands) doubled the production capacity for tantalum concentrates at its Mibra lithium-tantalum-niobium-tin mine in Minas Gerais State to 270 metric tons per year (t/yr) in 2018. The investment was part of a major reconfiguration of mine infrastructure to accommodate its first lithium concentrates processing plant, which was officially commissioned in May 2018 (AMG Advanced Metallurgical Group NV, 2018). Tantalum production at the Mibra Mine in 2019 was not disclosed.

China.—According to news sources, Jiujiang Jinxin Nonferrous Metals Co. Ltd. began construction on a manufacturing plant that could produce up to 2,000 t/yr of tantalum and niobium oxide. The plant would be located in Shuikoushan economic development zone, Changning City, Hunan Province. Construction was expected to take 18 months to complete (Argus Metals International, 2019).

Congo (Kinshasa).—Société Minière de Bisunzu Sarl (SMB), a leading producer of columbite-tantalite ore, owned the mining license for one of the largest columbite-tantalite deposits in the country and ran a mechanized mining operation in the North Kivu Province. Under an agreement with a local cooperative, artisanal miners also mined ore within the company's licensed areas and SMB retained exclusive rights to purchase that ore. Early in 2019, SMB ended its contract with the International Tin Supply Chain Initiative certification (ITSCI) program, which monitored mineral supply chains to ensure responsible sourcing from high-risk areas. According to SMB, it was no longer able to participate in the ITSCI program because of rising costs. The company later joined another certification program implemented by RCS Global Group (Germany), which developed a new digital tracing system for mineral production (Mahamba and Lewis, 2019; Ross and Lewis, 2019; Société Minière de Bisunzu Sarl, 2021).

Russia.—LLC Lovozero GOK operated the Lovozero Mine in the Murmansk region. The company produced loparite mineral concentrates that were consumed by JSC Solikamsk Magnesium Works to produce tantalum compounds at its facility in the Perm region. Solikamsk reported 32 t of tantalum oxide contained in shipments of tantalum compounds in 2019, 28% less than shipments in 2018 (JSC Solikamsk Magnesium Works, 2020, p. 12–14).

Outlook

Tantalum is produced as a byproduct from many lithium hard-rock deposits, typically spodumene-bearing pegmatites. Global demand for lithium has increased significantly in recent years. As a result, several new hard-rock lithium mining operations, many in Australia, have started production, and these operations may become significant sources of tantalum as a byproduct. However, Africa, where tantalum is produced primarily at artisanal and small-scale mining operations, is still expected to remain the leading tantalum-producing region in the near future.

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TABLE 1
SALIENT TANTALUM STATISTICS¹

	2015	2016	2017	2018	2019
United States:					
Exports:					
Niobium ores and concentrates, gross weight	73	14	7	5	27
Synthetic ores and concentrates, gross weight	138	379	113	198	40
Tantalum ores and concentrates, gross weight	98	162	109	48	28
Tantalum-containing ores and concentrates, ² tantalum (Ta) content	85	152	65	68	26
Tantalum, unwrought, Ta content ³	235	223	220	185	137
Tantalum, waste and scrap, Ta content ³	280	171	169	305	145
Tantalum, wrought, Ta content ³	57	58	95	124	115
Total exports, Ta content	657	604	549	681	423
Imports for consumption:					
Niobium ores and concentrates, gross weight	--	1	1	31	3
Synthetic ores and concentrates, gross weight	--	9	15	12	6
Tantalum ores and concentrates, gross weight	730	675	1,010	1,050	840
Tantalum-containing ores and concentrates, ² Ta content ^c	221	207	311	330	257
Tantalum, unwrought, Ta content ³	416	320	484	617	525
Tantalum, waste and scrap, Ta content ³	565	489	586	608 ^r	515
Tantalum, wrought, Ta content ³	42	48	74	101	83
Total imports, Ta content	1,240	1,060	1,460	1,660	1,380
Apparent consumption, ⁴ Ta content	587	460	907	975 ^r	957
Price, tantalite, ⁵ tantalum oxide (Ta ₂ O ₅) content	193	193	193	214	161
Value, ⁶ tantalum ores and concentrates, gross weight	65	53	39	57	50
World, production of tantalum concentrates, Ta content ^c	1,660	1,680 ^r	1,910 ^r	2,020 ^r	1,850

^cEstimated. ^rRevised. do. Ditto. -- Zero.

¹Includes data available through October 14, 2020. Data are rounded to no more than three significant digits, except values.

²Includes natural and synthetic tantalum-containing ores and concentrates. Ta content of ores and concentrates is estimated assuming the following Ta₂O₅ contents: 32% in niobium ore, 32% in synthetic concentrates, and 37% in tantalum ore. Ta₂O₅ is 81.897% Ta.

³Tantalum content estimated at 100%.

⁴Defined as imports minus exports.

⁵Average annual price in dollars per kilogram of Ta₂O₅ content as reported by CRU Group.

⁶Weighted average value of imported plus exported materials.

TABLE 2
U.S. FOREIGN TRADE IN TANTALUM-CONTAINING ORE AND CONCENTRATES AND TANTALUM METAL AND ALLOYS, BY CLASS¹

HTS ² code	Class	2018		2019		Principal destinations and sources in 2019 (gross weight in kilograms and values in thousand dollars)
		Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)	
Exports:						
2615.90.3000	Synthetic concentrates	198,000	\$3,020	40,100	\$975	China 24,000, \$869; United Kingdom 16,000, \$107.
2615.90.6030	Niobium ores and concentrates	4,510	133	26,900	163	India 24,800, \$104; Russia 759, \$22; United Kingdom 630, \$18; France 322, \$9.
2615.90.6060	Tantalum ores and concentrates	48,000	316	27,800	168	United Kingdom 27,800, \$168.
8103.20.0030	Tantalum, unwrought, powders	181,000	78,900	113,000	45,600	Mexico 40,700, \$19,400; El Salvador 38,600, \$11,300; Japan 15,400, \$6,960.
8103.20.0090	Tantalum, unwrought, other	3,900	1,440	24,300	9,180	Mexico 12,700, \$5,930; Germany 9,850, \$2,490; Austria 1,160, \$465.
8103.30.0000	Tantalum, waste and scrap	305,000	31,600	145,000	17,600	Kazakhstan 62,600, \$6,540; Japan 19,800, \$2,100; Germany 18,700, \$2,450.
8103.90.0000	Tantalum, wrought	124,000	80,200	115,000	83,700	China 43,900, \$30,500; Republic of Korea 36,700, \$30,400; Germany 9,720, \$5,970.
	Total exports	864,000	196,000	492,000	157,000	
Imports for consumption:						
2615.90.3000	Synthetic concentrates	11,800	186	5,810	31	Brazil 5,670, \$27; Canada 141, \$5.
2615.90.6030	Niobium ores and concentrates	30,700	398	3,370	179	Canada 2,770, \$126; Hong Kong 284, \$28; China 162, \$9.
2615.90.6060	Tantalum ores and concentrates	1,050,000	62,600	840,000	43,100	Australia 454,000, \$21,500; Rwanda 238,000, \$14,200; United Arab Emirates 73,100, \$2,080.
8103.20.0030	Tantalum, unwrought, powders	322,000	87,500	259,000	74,200	Germany 98,700, \$28,500; China 83,200, \$25,600; Thailand 66,700, \$17,900.
8103.20.0090	Tantalum, unwrought, other	296,000	86,100	267,000	76,400	China 115,000, \$32,200; Germany 49,800, \$19,100; Kazakhstan 39,800, \$10,700.
8103.30.0000	Tantalum, waste and scrap	608,000 ^r	46,400 ^r	515,000	29,700	Indonesia 136,000, \$3,500; China 110,000, \$7,370; Japan 103,000, \$6,820.
8103.90.0000	Tantalum, wrought	101,000	45,800	83,200	34,700	China 48,000, \$19,000; Kazakhstan 18,100, \$5,730; Austria 5,770, \$4,480.
	Total imports	2,420,000	329,000	1,970,000	258,000	

^rRevised.

¹Table includes data available through July 28, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

Sources: U.S. Census Bureau and U.S. Geological Survey.

TABLE 3
U.S. IMPORTS FOR CONSUMPTION OF TANTALUM ORES AND CONCENTRATES, BY COUNTRY
OR LOCALITY^{1,2}

Country or locality	2018		2019	
	Gross weight (kilograms)	Value (thousands)	Gross weight (kilograms)	Value (thousands)
Australia	176,000	\$10,400	454,000	\$21,500
Burundi	70,300	4,720	--	--
China	3,140	74	61	14
Congo (Brazzaville)	20,000	1,070	--	--
Congo (Kinshasa)	93,900	5,880	--	--
India	9,440	367	--	--
Japan	2,530	571	--	--
Macau	--	--	15,000	789
Mauritius	--	--	13,600	927
Mozambique	64,900	4,580	46,800	3,650
Nigeria	8,000	532	--	--
Rwanda	562,000	30,100	238,000	14,200
Tanzania	2,830	593	--	--
Thailand	18,400	847	--	--
United Arab Emirates	22,800	2,890	73,100	2,080
Total	1,050,000	62,600	840,000	43,100

-- Zero.

¹Table includes data available through July 28, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States code 2615.90.6060.

Sources: U.S. Census Bureau and U.S. Geological Survey.

TABLE 4
TANTALUM: WORLD PRODUCTION OF MINERAL CONCENTRATES, BY COUNTRY OR LOCALITY^{1,2}

(Kilograms, tantalum content)

Country or locality ³	2015	2016	2017	2018	2019
Australia, tantalite concentrates	68,200	11,000 ^r	20,000 ^r	32,000 ^r	67,000
Bolivia, tantalite concentrates	314	--	2,100	14,400 ^r	10,000 ^e
Brazil, mineral concentrates ⁴	268,000	234,000 ^r	270,000 ^r	360,000 ^{r,e}	430,000 ^e
Burundi, ore and concentrates ^e	10,000	6,200	28,000	43,000 ^r	38,000
China, mineral concentrates	63,000 ^e	65,000	75,000	90,000	76,000 ^e
Congo (Kinshasa): ^e					
Cassiterite concentrates	125,000	180,000	280,000	240,000	300,000
Columbite-tantalite concentrates	465,000	530,000	480,000	500,000	280,000
Total	590,000	710,000	760,000	740,000	580,000
Ethiopia, columbite-tantalite concentrates ^e	59,000	63,000	65,000	70,000	70,000
Mozambique, columbite-tantalite concentrates	12,818	18,767	26,000 ^r	30,000 ^r	30,000 ^e
Namibia, tantalite concentrates	--	430	2,200 ^e	330 ^e	2,540 ^e
Nigeria, columbite-tantalite concentrates	150,000	210,000 ^e	180,000 ^{r,e}	180,000 ^{r,e}	180,000 ^e
Russia, loparite concentrates	25,879	39,966	36,444	36,200 ^r	25,900
Rwanda:					
Cassiterite concentrates	58,000	53,000	71,000	71,000	56,000
Columbite-tantalite concentrates ^e	350,000	270,000	370,000	350,000	280,000
Total	408,000	323,000	441,000	421,000	336,000
Uganda, ore and concentrates ^e	1,000	2,800	2,500	2,900 ^r	3,000
Grand total ^e	1,660,000	1,680,000 ^r	1,910,000 ^r	2,020,000 ^r	1,850,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through October 14, 2020. All data are reported unless otherwise noted. Grand totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Figures for all countries and (or) localities represent marketable output.

³In addition to the countries and (or) localities listed, French Guiana and Venezuela may have produced tantalum mineral concentrates, but available information was inadequate to make reliable estimates of output.

⁴Includes columbite-tantalite and microlite.