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TUNGSTEN [ADVANCE RELEASE]

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TUNGSTEN

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In 2014, world production of tungsten concentrates increased for the fifth consecutive year to a record high of 86,800 metric tons (t) (table 1). The increase was primarily because of increased production from Vietnam, where Masan Resources Corp.'s Nui Phao Mine was ramping up production (table 15). Scrap recycling continued to be an important source of raw material to the tungsten industry. World tungsten supply exceeded world consumption and resulted in a significant accumulation of tungsten stocks in China. Throughout the year, tungsten prices in China, Europe, and the United States continued to trend downward from recent highs in 2013.

Domestically, one tungsten mine produced and shipped ore concentrates. Most of the U.S. supply of tungsten raw materials comprised imports, scrap, and sales from the National Defense Stockpile (NDS). China continued to be the leading supplier of downstream tungsten materials and products imported by the United States. U.S. apparent consumption of all forms of tungsten increased by 3% in 2014 compared with that of 2013 and was 17% lower than the record high of 18,100 t in 2011.

Tungsten is a whitish-gray metal with the highest melting point of all metals and one of the highest densities. When combined with carbon to make tungsten carbide, it is almost as hard as diamond. These and other properties make it useful in a wide variety of important commercial, industrial, and military applications. The leading use for tungsten is as tungsten carbide in cemented carbides, which are wear-resistant materials used by the construction, metalworking, mining, and oil and gas drilling industries. Pure or doped tungsten metal is used for contacts, electrodes, and wires in electrical, electronic, heating, lighting, and welding applications. Tungsten is also used to make alloys and composites to substitute for lead in ammunition and other products; heavy-metal alloys for armaments, heat sinks, radiation shielding, and weights and counterweights; superalloys for turbine engine parts; tool steels; and wear-resistant alloy parts and coatings. Tungsten chemicals are used to make catalysts, corrosion-resistant coatings, dyes and pigments, fire-resistant compounds, lubricants, phosphors, and semiconductors.

Most data in this report have been rounded to three significant digits. Totals and percentages were calculated from unrounded numbers. Unless otherwise specified, all statistics in this report are in metric tons of contained tungsten. Most tungsten prices and many tungsten statistics from other sources are quoted in units of tungsten trioxide (WO_3). The short ton unit, which is used in the United States, is 1% of a short ton (20 pounds), and WO_3 is 79.3% tungsten by weight. A short ton unit of WO_3, therefore, equals 20 pounds of WO_3 and contains 7.19 kilograms (kg) (15.86 pounds) of tungsten. The metric ton unit, which is used in most other countries, is 1% of a metric ton (10 kg). A metric ton unit of WO_3, therefore, equals 10 kg of WO_3 and contains 7.93 kg (17.48 pounds) of tungsten.

Legislation and Government Programs

During fiscal year 2014 (October 1, 2013, through September 30, 2014), Defense Logistics Agency Strategic Materials (DLA Strategic Materials), U.S. Department of Defense, sold ores and concentrates containing 322 t of tungsten. All of the tungsten sold was shipped by the end of the fiscal year. During the calendar year, DLA Strategic Materials sold ores and concentrates containing 274 t of tungsten. The quantities of tungsten materials remaining in the stockpile at the end of the calendar year are listed in tables 1 and 2. DLA Strategic Materials reported the following goals for tungsten materials—tungsten metal powder, none; tungsten ores and concentrates, 5,120 t of contained tungsten. Goals are the amounts of materials to be maintained in the NDS and were based on the 2013 Biennial Report on Stockpile Requirements (U.S. Department of Defense, 2015, p. 4, 8).

The Annual Materials Plan for fiscal year 2014, which represented the maximum quantities of tungsten materials that could be sold, is listed in table 2. The quantities of tungsten available for sale during fiscal year 2015 (October 1, 2014, through September 30, 2015) were decreased to 1,360 t of tungsten contained in ores and concentrates and 35 t of tungsten metal powder (Defense Logistics Agency Strategic Materials, 2014).

In March, a World Trade Organization (WTO) dispute settlement panel found that China's export quotas and export duties for tungsten constituted a breach of WTO rules and that China failed to justify that the quotas were a legitimate measure for conserving exhaustible natural resources and that the duties were a legitimate measure for protecting the environment. The Peoples Republic of China appealed the panel's findings, but in August, the WTO Appellate Body affirmed the findings and rejected China's appeal. In September, China announced its intention to implement the recommendations and rulings in the dispute and agreed with the Governments of the United States, the European Union, and Japan to terminate its tungsten export duties and quotas by May 2, 2015 (Office of the United States Trade Representative, undated).

The U.S. Securities and Exchange Commission (SEC) was responsible for implementing Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, which related to the use of minerals determined to be financing conflict in Congo (Kinshasa) or an adjoining country. Wolframite, one of two principal minerals mined for tungsten, was included in the list of conflict minerals. Section 1502 required companies for which conflict minerals or their derivatives were necessary to the functionality or manufacture of their products to disclose annually, beginning in 2014, whether any of those minerals originated in Congo (Kinshasa) or an adjoining country. In 2014,

1,321 companies filed conflict minerals disclosures for 2013; 67% reported that they were unable to determine the country of origin of the conflict minerals that they used, 24% reported that their conflict minerals did not originate in covered countries, 4% reported that their conflict minerals originated in covered countries, 3% did not provide a clear determination, and 2% reported that their conflict minerals came from scrap. Tungsten concentrate production from Congo (Kinshasa) and adjoining countries has been only 1% to 2% of world production in recent years (table 15) (U.S. Securities and Exchange Commission, 2012, p. 56274–56275; U.S. Government Accountability Office, 2015, p. 5).

In response to the Act, the Tungsten Industry–Conflict Minerals Council (TI–CMC) was formed by tungsten processors to help its members provide downstream tungsten consumers, industry stakeholders, and the public with assurances that the tungsten products they supplied were conflict free. TI–CMC collaborated with the Conflict-Free Sourcing Initiative (CFSI) so that TI–CMC members' processing plants could undergo CFSI's Conflict-Free Smelter Program (CFSP) audits. At yearend, 26 TI–CMC companies had agreed to complete the CFSP audit within 2 years of joining TI–CMC (Tungsten Industry–Conflict Minerals Council, 2014, 2015).

Production

Domestic production statistics for tungsten are based on data collected by the U.S. Geological Survey (USGS) by means of two separate voluntary surveys. Statistics that result from these surveys are listed in tables 1 and 3. The annual "Tungsten Ore and Concentrate Survey" covered the production, purchase, disposition, and stocks of tungsten ores and concentrates. In 2014, Curtis Tungsten, Inc. (Upland, CA) produced and shipped scheelite concentrates from the Andrew Mine northeast of Los Angeles, CA.

In 2014, Silver Predator Corp. (Vancouver, British Columbia, Canada) acquired Springer Mining Co. from Americas Bullion Royalty Corp. (Vancouver). The Springer complex, in Pershing County, NV, comprised an underground scheelite mine, a beneficiation plant, and a processing circuit designed to produce either ammonium paratungstate (APT) or calcium tungstate (also known as synthetic scheelite). A preliminary economic assessment on the operation proposed production of scheelite concentrate containing an average of 1,070 metric tons per year (t/yr) of tungsten during an initial 5-year mine life, based on the current resource. Silver Predator stated that all major permits were in place and forecast that production could begin within 12 months of obtaining financing. The company planned to obtain a joint-venture partner to help bring the operation into production (Silver Predator Corp., 2015, p. 3–4, 6, 10, 14, 22, 24).

Thor Mining PLC (Marleston, South Australia, Australia) acquired the Pilot Mountain tungsten project approximately 200 kilometers (km) southeast of Reno, NV. The project comprised four deposits—Desert Scheelite, Gunmetal, Garnet, and Good Hope—within 3 km of one another. Thor announced a three-stage development plan to explore, evaluate, and permit the project for development (Thor Mining PLC, 2014).

The USGS monthly "Tungsten Concentrate and Tungsten Products Survey" canvassed companies that produced tungsten carbide powder, tungsten chemicals, and (or) tungsten metal powder from APT, tungsten-bearing scrap, and tungsten concentrate. Where possible, data for nonrespondents to the survey were estimated based on prior reports or information from other sources. U.S. processors of tungsten materials operating in 2014 are listed in table 4.

In 2014, U.S. processors consumed more APT, tungsten concentrates, and scrap than in 2013. Domestic production of APT was greater than that of 2013. Total net production of tungsten metal powder and tungsten carbide powder was 3% more than that of 2013 (table 3).

Following its acquisition of the tungsten materials business of Allegheny Technologies Inc. (ATI) in late 2013, Kennametal Inc. (Latrobe, PA) began a multiyear restructuring process to consolidate operations. Kennametal planned to close its Kingston plant in Latrobe, PA, and move the plant's tungsten carbide powder production to a former ATI plant in Huntsville, AL. Kennametal also planned to close a former ATI plant in Grant, AL, and move its production of cemented carbide blanks and wear parts to other plants in North America (Coyne, 2015; Powder Metallurgy Review, 2015).

Niagara Refining LLC (a joint venture of Sumitomo Electric Carbide Inc. and Buffalo Tungsten Inc.'s subsidiary New York Tungsten LLC) reportedly began production at its newly constructed plant in Depew, NY, by yearend. The plant was permitted to produce a combined total of approximately 2,500 t/yr (2,750 short tons per year) of APT and tungsten oxides and would use ore concentrates and cemented carbide scrap as feed (New York State Department of Environmental Conservation, 2012, p. 1, 22; Bertola, 2014; Niagara Refining LLC, undated).

Consumption

U.S. apparent consumption of all tungsten materials, as calculated from net imports, secondary production, and changes in Government and industry stock levels, was 15,000 t in 2014, 3% more than the 2013 apparent consumption of 14,700 t. Primary U.S. production was not available to include in the calculation. In spite of a large decrease in tungsten shipments from the NDS, 2014 apparent consumption increased, mainly because of lower exports, which resulted in higher net imports compared with those of 2013.

Statistics on consumption of tungsten in end-use applications by U.S. metal consumers were developed from the voluntary "Consolidated Consumers Survey." For this survey, nearly 60 tungsten consumers were canvassed on a monthly or annual basis. Reported consumption and stocks data in tables 1 and 5 include estimates to account for nonrespondents.

Total U.S. reported consumption of tungsten materials to make end-use products in 2014 was 9% greater than that of 2013. Consumption to make cemented carbides, mill products, and superalloys was greater than that of 2013; consumption to make steel and other alloys was less than that of 2013. Compared with consumption in 2013, U.S. end users consumed more ferrotungsten, tungsten carbide powder, tungsten metal powder, and tungsten scrap. Estimated consumption of tungsten compounds in chemical applications remained unchanged.

Weekly reports of the number of operating drilling rigs give an indication of the demand for tungsten carbide in the form

of cemented carbide components used by industry to explore for or produce oil and natural gas. The number of rigs operating each week in the United States trended upward from January until September, was more or less the same for several months, and then steeply decreased from late November to yearend. The average number of weekly operating rigs in 2014 was 6% greater than the average number of operating rigs in 2013 (1,862 in 2014 as compared with 1,761 in 2013) (Baker Hughes Inc., undated).

Prices

In May, the weekly U.S. spot price for tungsten ore concentrate reported by Platts Metals Daily decreased from $320 to $330 per short ton unit ($353 to $364 per metric ton unit) to $300 to $320 per short ton unit ($331 to $353 per metric ton unit). The annual average of Platts' U.S. tungsten ore concentrate prices was 3% lower than that of 2013 (table 1).

The weekly U.S. APT price reported by Platts began the year at $325 to $330 per short ton unit ($358 to $364 per metric ton unit), decreased to $320 to $330 per short ton unit ($353 to $364 per metric ton unit) in mid-May, and then decreased to $310 to $320 per short ton unit ($342 to $353 per metric ton unit) in early December. The annual average of Platts' U.S. APT prices was 3% lower than that of 2013.

The ferrotungsten price reported by Platts trended downward in 2014. The first week of January the price was $62 to $65 per kilogram of contained tungsten. In December, it was $36 to $37 per kilogram of contained tungsten. The annual average price, at $46.74 per kilogram of contained tungsten, was slightly less than the annual average of $47.22 per kilogram of contained tungsten in 2013.

Tungsten products were traded on three Chinese exchanges. APT and tungsten metal were traded on the Fanya Metal Exchange. The Bohai Commodity Exchange reportedly began trading APT in August and tungsten concentrate in September. The Tianjin International Mining Exchange offered mining finance services under four market sectors—mining rights trading market, international mining financing market, mineral products spot trading market, and venture exploration capital market (Tungsten & Molybdenum Monthly, 2015b; Fanya Metal Exchange Co. Ltd., undated; Tianjin International Mining Exchange; undated).

Foreign Trade

The tungsten content of U.S. exports was 6,660 t, a 14% decrease from the 7,730 t exported in 2013 (tables 6–10). The tungsten content of U.S. imports was 12,800 t, 5% more than the 12,200 t imported in 2013 (tables 11–14). China, which continued to be the leading supplier of imported tungsten to the United States, provided 36% of all tungsten imports in 2014. The tungsten content of imports from China decreased by 7% to 4,610 t in 2014, from 4,960 t in 2013. The distribution of materials imported from China was as follows: APT, 27%; tungsten oxide, 22%; wrought tungsten, 14%; tungsten metal powders, 11%; tungsten carbide powders, 9%; ferrotungsten, 6%; unwrought tungsten and tungsten waste and scrap, 5% each; tungsten chlorides, other tungstates, other tungsten compounds, and tungsten ores and concentrates, less than 1% each. Other significant suppliers of tungsten materials to the United States were as follows: Canada, 12%; Germany, 9%; Bolivia, 8%; Spain, 6%; Vietnam, 5%; and Portugal, 4%.

The tungsten contained in U.S. imports of ores and concentrates was 10% greater than that of 2013. In 2014, the leading suppliers of U.S. imports of tungsten ores and concentrates were Canada (28%), Bolivia (24%), Spain (18%), Portugal (13%), Russia (5%), and Australia (4%) (table 11).

U.S. imports of APT were 20% lower than those of 2013 (table 12). China continued to be the dominant supplier, although the portion of U.S. APT imports from China has decreased from 94% in 2012 to 85% in 2013 to 70% in 2014; most of the remaining APT imports have been from Germany. Imports of other tungsten materials are presented in tables 13 and 14.

Net import reliance as a percentage of apparent consumption is one measure of the adequacy of current domestic production to meet U.S. demand. Net import reliance is defined as imports minus exports plus adjustments for Government and industry stock changes. Releases from stocks, including shipments from the NDS, were counted as part of import reliance, regardless of whether they were imported or produced in the United States. In 2014, U.S. net import reliance for tungsten as a percentage of apparent consumption was 43%, similar to the levels calculated for the previous 3 years. This indicates that about 40% of U.S. tungsten supply was from imports and stock releases, and about 60% was from scrap materials generated in the United States. Actual net import reliance might be lower if data for U.S. production of tungsten concentrates were available to be included in the calculation of apparent consumption. Net import reliance prior to 2011 was generally in the range of 60% to 70% because of lower levels of scrap consumption.

World Review

Estimated world production of tungsten concentrates was 4% greater than that of 2013, primarily because of an increase in production from Vietnam. China continued to be the leading producer of tungsten concentrates, accounting for 82% of total world production. Combined production outside of China increased by 24% compared with that of 2013. In addition to the increase from Vietnam, increases from Australia, Burundi, Canada, Mongolia, and Spain contributed to the growth of production outside China (table 15). World mine production was supplemented by tungsten recovered from scrap and tungsten materials released from the NDS in 2014.

Australia.—Tasmania Mines Ltd. (Sydney, New South Wales) produced a small amount of scheelite concentrate from its Kara open pit magnetite mine south of Burnie in Tasmania.

In September, Almonty Industries Inc. (Toronto, Ontario, Canada) acquired the Wolfram Camp Mine from Deutsche Rohstoff AG (Heidelberg, Germany). Wolfram Camp comprised an open pit tungsten-molybdenum mine and beneficiation plant west of Cairns, Queensland. Almonty began making improvements to the milling and processing circuit to improve throughput, reduce dilution, and increase tungsten recovery. The company also began an exploration program to delineate the resources and for pit optimization and planned to evaluate the potential for underground mining. Almonty agreed to continue

to supply U.S. tungsten processor Global Tungsten & Powders Corp. (GTP) with the wolframite concentrate from the mine (Almonty Industries Inc., 2014; 2015, p. 3, 12).

Carbine Tungsten Ltd. (Bungalow, Queensland) was developing its Mt. Carbine tungsten mine, west of Port Douglas in northern Queensland, in three stages—producing tungsten concentrate from tailings generated during past mining operations, processing low-grade stockpiled ore, and then open pit mining. Carbine Tungsten's production of mixed wolframite and scheelite concentrate from tailings ceased in December 2013. During 2014, the company continued to work on technical and commercial aspects of the stockpile and open pit development, including offtake discussions for concentrate production above that committed to Mitsubishi Corporation RtM Japan Ltd. (Tokyo, Japan). In October, Carbine Tungsten received a commitment from Mitsubishi to assist in the initial funding of the stockpile project (Carbine Tungsten Ltd., 2015, p. 2–3, 11, 15–16).

King Island Scheelite Ltd. (KIS) (Sydney, New South Wales) continued to investigate options for reducing the cost of reestablishing mining and processing operations at the former King Island Scheelite Mine on King Island, northwest of Tasmania. The company was considering open pit mining for 4 years, followed by underground mining for 9 years, supplemented by selective mining of relatively high-grade tailings from previous operations. Ore would be processed using gravity and flotation methods. During the year, KIS dewatered the main Dolphin pit, completed resource definition drilling, and began an evaluation of ore-sorting technology to improve process efficiency (King Island Scheelite Ltd., 2015).

Thor Mining worked to upgrade the feasibility study on its Molyhil tungsten-molybdenum project northeast of Alice Springs in the Northern Territory. The project was to comprise an open pit operation with a 6-year mine life and a beneficiation plant, which would use x-ray ore sorting and flotation to produce scheelite and molybdenite concentrates. Annual production was forecast to average 1,030 t/yr of tungsten in concentrate (130,000 metric ton units per year). Thor had a letter of intent from GTP to purchase 70% to 75% of Molyhil's tungsten concentrate production. Thor expected that concentrate production would begin 12 months after completing offtake agreements and securing project financing (Thor Mining PLC, 2015a, p. 4–6; 2015b).

In July, the Tasmanian government granted a mining lease to Venture Minerals Ltd. (Subiaco, Western Australia) for its Mt. Lindsay tin-tungsten project approximately 125 km south of the Port of Burnie. Venture planned to mine the ore by open pit and underground methods for 9 years and to include a circuit for producing APT in the processing plant (Venture Minerals Ltd., 2012; 2015, p. 7).

Vital Metals Ltd. (Subiaco, Western Australia) completed a definitive feasibility study on its fully permitted Watershed project northwest of Cairns, Queensland. The project comprised an open pit mine and beneficiation plant that would use ore sorting, gravity separation, and flotation to produce a high-grade scheelite concentrate. During an initial 9-year mine life, average production would be about 2,100 t/yr of tungsten in concentrate. During the 10th year of operation, concentrate production would be from low-grade stockpiles. Japan Oil, Gas and Metals National Corp. (JOGMEC) had a 30% interest in the project, which it intended to transfer to a Japanese company with an offtake interest and responsibility for arranging a share of the project financing. Vital hoped to begin construction in 2015 and to start mining before the end of 2016, pending the transfer of JOGMEC's share and completion of financing (Vital Metals Ltd., 2014, p. 1, 4, 12).

Austria.—Wolfram Bergbau und Hütten AG (owned by Sandvik AB, Sandviken, Sweden) operated the Mittersill scheelite mine and beneficiation plant in the State of Salzburg, and the Bergla tungsten processing plant and a tungsten recycling unit near St. Martin in the State of Styria. The Mittersill Mine supplied some of the concentrate feed for the Bergla processing plant; the remainder was imported.

Brazil.—Bodo Mineracao Ltda. (a subsidiary of Brazilian Tungsten Holdings Ltd.) mined ore from the underground Bodo Mine, Rio Grande do Norte State and, during the first 11 months of 2014, produced scheelite concentrates containing approximately 20 t of tungsten (2,722 metric ton units of WO_3). Evocutis Plc (London, United Kingdom) planned to invest in the mine so that ore production could be tripled and the beneficiation plant could be modified to increase tungsten recovery (Evocutis Plc, 2014).

Largo Resources Ltd. (Toronto, Ontario, Canada) kept its Currais Novos tailings reprocessing project west-southwest of Natal, Rio Grande do Norte State, on care-and-maintenance status for a second year, owing to persistent severe drought conditions. The company planned to resume production of scheelite concentrate after rainfall returned to normal levels (Largo Resources Ltd., undated).

Canada.—North American Tungsten Corp. Ltd. (NATC) (Vancouver, British Columbia) produced 10% more tungsten in scheelite concentrates from its Cantung operation in the Northwest Territories than in 2013. During the year, NATC substantially completed enhancements to the mill to increase throughput by as much as 20% and to improve metallurgical recoveries from the gravity and flotation circuits. In addition, NATC estimated sufficient reserves to support mining beyond 2017. In September, the Yukon and Federal governments granted environmental approval to NATC's Mactung scheelite deposit in the Yukon, which will allow the company to continue with permitting (North American Tungsten Corp. Ltd., 2015, p. 2, 4–6).

Northcliff Resources Ltd. (Vancouver, British Columbia) worked to advance the environmental impact assessment, project financing, and offtake agreement for its Sisson tungsten-molybdenum project. The project, in east-central New Brunswick, comprised an open pit mine, a beneficiation plant to produce tungsten and molybdenum concentrates, and an onsite processing plant to convert the scheelite concentrate to APT. APT production was expected to average approximately 4,420 t/yr of contained tungsten during the 27-year life of the mine. Todd Corp. (Wellington, New Zealand) held an 11.5% interest in the project (Northcliff Resources Ltd., 2015, p. 5).

China.—In 2014, China's production of concentrates increased slightly to an estimated 71,000 t of contained tungsten. Despite its position as the world's leading miner of

tungsten, China has imported significant quantities of tungsten concentrates in recent years. In 2014, China imported 3,434 t of tungsten in concentrates. Scrap recycling also contributed to China's tungsten raw materials supply. Based on supply (mine production plus imports), consumption, and exports, one analyst estimated that, in 2014, the Chinese market had a tungsten surplus of 21,100 t (Tungsten & Molybdenum Monthly, 2015c; United Nations Statistics Division, undated).

The Government of China maintained a program to conserve its tungsten resources and to ensure that its tungsten supply would meet anticipated demand. The program included regulating the production of tungsten concentrates through exploration and mine licenses, mine closures, and production quotas; regulating the processing of tungsten concentrates; and regulating tungsten exports by issuing export licenses, imposing export duties, and restricting the volumes and types of tungsten materials and products that could be exported. For 2014, the tungsten concentrate production quota remained at 89,000 t (65% WO_3) with 80% as primary mine production and 20% as comprehensive recovery from other sources. China's concentrate production is typically greater than the quota. For example, the 2014 quota of 89,000 t (65% WO_3) was equivalent to approximately 45,900 t of contained tungsten, but production was estimated to be 71,000 t of contained tungsten. The excess production was attributed to excess production under the comprehensive recovery category, production by trading companies that was not controlled by the quota, and double-counting. In 2014, China's export quota remained at 15,400 t of tungsten contained in materials and products (Xiao, 2014, p. 6, 8, 27).

In 2014, China's State Bureau of Material Reserve reportedly purchased 20,000 t of tungsten concentrates for its national stockpile. Additional purchases in 2015 were anticipated because of an expected oversupply of tungsten concentrates (Tungsten & Molybdenum Monthly, 2015b, c).

The Ganzhou Tungsten Association issued monthly recommended prices for wolframite concentrate, APT, and tungsten carbide powder; China Minmetals Corp. issued monthly recommended prices for scheelite and wolframite concentrates.

H.C. Starck Jiangwu Tungsten Specialties (Ganzhou) Co., Ltd. [a joint venture of H.C. Starck GmbH and Jiangxi Rare Metals Tungsten Holdings Group Co. Ltd. (JXTC)] began APT production from its newly constructed processing plant at midyear. The plant, in Ganzhou City, Jiangxi Province, reportedly had the capacity to produce 6,000 t/yr, gross weight, of APT and 8,000 t/yr, gross weight, of tungsten oxide (Tungsten & Molybdenum Monthly, 2015b).

Congo (Kinshasa).—As discussed in the "Legislation and Government Programs" section of this report, companies reporting to the SEC are subject to the conflict minerals rules in the Dodd-Frank Wall Street Reform and Consumer Protection Act with regard to tungsten exports from Congo (Kinshasa) and adjoining countries.

Korea, Republic of.—Woulfe Mining Corp. (Vancouver, British Columbia, Canada) updated the feasibility study on restarting production from the underground Sangdong tungsten-molybdenum mine southeast of Seoul in Gangwon Province. The project was to have a mine life of 12 years and would use mineral flotation to produce 3,000 to 3,700 t of tungsten in scheelite concentrate. In December, Woulfe canceled its minority interest in APT Co., which planned to build an APT plant in the Republic of Korea. IMC International Metalworking Companies B.V. held the majority interest in APT Co., which agreed to acquire 90% to 100% of Sangdong's annual tungsten concentrate production, pursuant to an offtake agreement (Woulfe Mining Corp., 2015, p. 3–4).

Peru.—Minera Tungsteno Malaga del Peru S.A. took over the Pasto Bueno Mine and beneficiation plant in the Ancash region after assuming the former owners' debts. At midyear, Minera Tungsteno restarted production of tungsten concentrate. The company planned to increase production and was considering reprocessing stockpiled tailings (Metal-Pages, 2014).

Portugal.—Sojitz Beralt Tin and Wolfram (Portugal) S.A. (Barroca Grande) produced wolframite (ferberite) concentrate from the Panasqueira Mine and beneficiation plant in central Portugal. Concentrate from Panasquiera was sent to Japan, the United States, and elsewhere to be processed.

W Resources PLC (London, United Kingdom) was granted a 4-year trial mining license at its Régua deposit 95 km east of Porto in north-central Portugal. The company planned to continue exploration drilling to increase the resource, then fast-track a mine with first production in late 2016 (W Resources PLC, 2015, p. 3).

Russia.—In 2014, five companies mined tungsten and produced concentrates. The companies, including the locations of their operations and listed in order of their share of production, were as follows: JSC A&IR Mining, which produced concentrates from ores mined by Primorsky GOK in Primorskiy Kray; KGUP Primteploenergo, which had the exploration and mining license for the Lermontov Mine in Primorskiy Kray; Russkaya Gornorudnaya Kompaniya (RGRK, the Russian Ore Mining Company), which managed JSC Novoorlovsky GOK in Zabaykal'sk Kray; Wolfram Company CJSC, which owned CJSC Buryat Wolfram in Zakamensk, Buryatiya Republic; and prospectors' cooperative Artel Quartz Ltd. (Kvarz) in Zabaykal'sk Kray. In addition, Wolfram Company (Moscow) produced concentrate from tailings generated during previous mining. Wolfram Company's Hydrometallurg plant at Nalchik, Kabardino-Balkariya Republic, produced APT and yellow tungsten oxide, and Kirovgradskiy Zavod Tverdykh Splavov OAO's Kirovgrad Hard Alloys plant in Sverdlovsk Oblast produced APT and tungsten anhydride (Gorbachev, 2015, p. 14, 21).

Rwanda.—Tinco Investments Ltd. (London, United Kingdom) signed a 25-year mining agreement with the Government of Rwanda for its Nyakabingo tungsten mine in the Rulindo District, Nord Province. Tinco planned to double production of tungsten concentrate from the mine from 25 metric tons per month (t/mo), gross weight, to 50 t/mo by yearend 2016 (Metal Bulletin, 2014, 2015). Rwanda is included in the Dodd-Frank legislation discussed in the "Legislation and Government Programs" section of this report.

Spain.—Daytal Resources Spain, S.L. (a subsidiary of Almonty) produced 749 t of tungsten in concentrate from its Los Santos Mine and beneficiation plant in Salamanca Province, 47% more than the 510 t produced in 2013. The increase was

attributed to several factors. In 2013, production was negatively affected by incorrectly calibrated equipment, which reduced tungsten recovery rates, and by production stoppages for mill circuit optimization and for repairs following a fire. In 2014, the calibration was corrected, equipment installation and circuit upgrades were completed, and the average grade of ore mined was greater than that of the previous year. Daytal began to blend stockpiled tailings with freshly mined ore to optimize the feed grade for the processing equipment. Higher ore grades and optimized beneficiation were expected to result in increased future production (Almonty Industries Inc., 2015, p. 5–9).

W Resources completed construction of its La Parrilla tailings processing plant and began producing tungsten concentrate in the Extremadura region in the Provinces of Badajoz and Caceres. During 2014, W Resources shipped approximately 103 t of 60% WO_3 concentrates (about 50 t of contained tungsten). The company planned to develop the La Parrilla open pit mine in two stages—a smaller fast-track operation designed to produce approximately 630 t/yr of tungsten in concentrate and a larger operation designed to produce approximately 1,800 t/yr of tungsten in concentrate (W Resources PLC, 2015, p. 2).

Ormonde Mining PLC (Dublin, Ireland) received the environmental permit and mining concession for its Barruecopardo tungsten project in Salamanca Province, which helped the company finalize funding for the project's development by mid-2015. Barruecopardo was the leading tungsten mine in Spain until its closure in the early 1980s. Ormonde planned to develop a 9-year open pit operation, with a potential later expansion underground. Ore was to be beneficiated using gravity and flotation methods to produce scheelite concentrates containing approximately 2,000 t/yr of tungsten, with commissioning by yearend 2016. Ormonde signed an offtake agreement with Noble Resources International Pte. Ltd., under which Noble would purchase all of the tungsten concentrate produced from the mine during its first 5 years of operation (Ormonde Mining PLC, 2015a, p. 4, 7–8; 2015b, p. 4, 11–12).

Taiwan.—Taiwan Wolfram Metal Industry Co., Ltd.'s construction of an APT plant in Taiwan Zhang Bing Industrial Park reportedly was delayed by Government procedures. The plant, which was to have the capacity to produce about 4,000 t/yr of APT and 1,000 t/yr of tungsten trioxide, originally was scheduled to begin production in 2014 (Hack, 2014b).

United Kingdom.—In February, Wolf Minerals Ltd. (Subiaco, Western Australia, Australia) began construction of its Hemerdon tungsten and tin project in Devon, northeast of Plymouth. The project comprised the Drakelands open pit mine and a beneficiation plant, which were expected to produce approximately 2,740 t/yr of tungsten in wolframite concentrate and 460 t/yr of tin in concentrate for a minimum of 9 years. By yearend, construction was 67% complete and more than 100,000 t of ore had been stockpiled at the mine. Wolf Minerals planned to begin production in 2015 and had offtake contracts for tungsten concentrate with GTP and Wolfram Bergbau (Wolf Minerals Ltd., 2014, p. 1, 27, 45; 2015).

Vietnam.—In May, Vietnam Youngsun Tungsten Industry Co., Ltd., suspended production and evacuated the Chinese employees from its ferrotungsten plant in Halong City, Quang Ninh Province, as a result of unrest in Vietnam after China placed an oil rig in waters claimed by both countries. Youngsun reportedly planned to restart production in September. In November, production was suspended a second time, owing to low ferrotungsten prices and a lack of demand. Youngsun planned to keep the plant idle until April 2015 (Hack, 2014a, c).

Asia Tungsten Products Co. Ltd. (ATC) (60% Hazelwood Resources Ltd.) operated its ferrotungsten plant in the Vinh Bao district near the port of Haiphong for the first three quarters of 2014. During that time, the plant produced 765 t of ferrotungsten containing approximately 597 t of tungsten (446 t of ferrotungsten containing approximately 338 t of tungsten in 2013). ATC suspended production during the fourth quarter of 2014 to destock inventories, preserve cash, and avoid purchasing concentrates at prices higher than those anticipated in 2015 (Hazelwood Resources Ltd., 2013, p. 6; 2014, p. 3; 2015, p. 3).

Nui Phao Mining Co. Ltd. (Masan Resources Corp., Ho Chi Minh City) completed the commissioning of its Nui Phao Mine about 80 km north of Hanoi in Thai Nguyen Province and began commercial production by yearend. The project comprised an open pit mine and processing complex to produce fluorspar, copper concentrate, APT, and bismuth, listed in order of annual output. In 2014, Nui Phao produced 6,602 t, gross weight, of tungsten concentrate by gravity separation (1,256 t in 2013); 1,716 t, gross weight, of low-grade tungsten concentrate by high intensity magnetic separation (335 t in 2013); and 2,333 t, gross weight, of sodium tungstate. During the year, the Nui Phao H.C. Starck Tungsten Chemicals Manufacturing joint venture converted Nui Phao's onsite sodium tungstate plant to a plant that would produce APT and yellow and blue tungsten oxides. All of Nui Phao's tungsten concentrate (up to 10,000 t/yr, gross weight, containing approximately 5,150 t/yr tungsten) would be processed at the APT plant (Masan Resources Corp., 2015, p. 4, 38; undated).

Tungsten-tin mining took place at a state-owned operation in Tuyen Quang Province, northwest of Hanoi. Two companies produced APT and downstream tungsten products from concentrates and scrap in southern Vietnam—Sanher Tungsten Vietnam Co. Ltd. in Dong Nai Province and Tejing (Vietnam) Tungsten Co., Ltd. in Tay Ninh Province (Zeiler, 2015, p. 8, 13).

Zimbabwe.—RHA Tungsten Pvt. Ltd. (National Indigenisation and Economic Empowerment Fund and Premier African Minerals Ltd.) worked to restart production from the former RHA tungsten mine in the Kamativi Tin Belt of northwestern Zimbabwe. The company planned to extract ore from an open pit for 18 months and then shift to underground mining. Wolframite concentrate would be produced by gravity methods. Approximately 46 t/mo of tungsten in concentrate was to be produced from the open pit, beginning in mid-2015 (Premier African Minerals Ltd., 2014, p. 8, 22; 2015).

Outlook

World tungsten supply will continue to be dominated by China's production and exports. The Chinese Ministry of Land and Resources increased the total tungsten production quota for 2015 to 91,300 t (65% WO_3) from 89,000 t (65% WO_3) in 2014 and maintained the ban on issuing new mining licenses until June 30, 2015. As a result of the WTO ruling on China's export policies, China's tungsten export quota and export duties were terminated in 2015; however, the Ministry of Industry and Information Technology planned to strengthen its control and management of tungsten mining, production, and distribution (Xu, 2014; Argus Tungsten Monthly Outlook, 2015; Tungsten & Molybdenum Monthly, 2015a, b).

In the next few years, tungsten concentrate production from outside China is expected to continue to increase. Some of the increase is expected to come from improved production from existing mines and some is expected to come from the ramp up of production at recently started mines and tailings operations. In addition, as discussed in the "World Review" section of this report, numerous companies worked to develop tungsten deposits, produce tungsten concentrate from stockpiled tailings, or restart production from inactive mines in Africa, Asia, Australia, Europe, and North America. The amount, location, and timing of future production will depend on the companies' ability to acquire funding. Increased production capacity for APT outside China is also planned. Scrap will continue to be an increasingly important source of raw material for the tungsten industry worldwide.

Tungsten consumption is strongly influenced by general economic conditions. Future consumption of tungsten in cemented carbides, which is the leading end-use sector, will depend on the performance of the following industries: automotive and aircraft production; construction; electronics manufacturing, where cemented carbide microdrills are used on circuit boards; general manufacturing; large equipment manufacturing; mining; and oil and gas drilling. Tungsten use is also influenced by Government spending for defense applications.

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TABLE 1
SALIENT TUNGSTEN STATISTICS[1]

(Metric tons, tungsten content and dollars per metric ton unit)

	2010	2011	2012	2013	2014
United States:					
Concentrates:					
Production	NA	NA	NA	NA	NA
Consumption	4,820	W	W	W	W
Exports	276	169	203	1,060	1,230
Imports for consumption	2,740	3,640	3,650	3,690	4,080
Stocks, December 31:					
Consumer	W	W	W	W	W
U.S. Government[2]	17,000	15,800	14,000	11,900	11,600
Price:					
U.S. spot quotation[3]	183	248	358	358	348
European[4, 5]	150	150	XX	XX	XX
Ammonium paratungstate:					
Production	W	W	W	W	W
Consumption[6]	10,300	W	W	W	W
Stocks, December 31, producer and consumer	62	W	W	W	W
Price:					
U.S. free market[4, 7]	214	370	XX	XX	XX
U.S. market[3]	186	397	449	369	358
European free market[8]	244	431	386	372	357
Primary products:					
Net production[9]	8,340	7,790	6,360	6,150	6,310
Consumption[10]	11,000	12,300	11,400	10,700	11,600
Stocks, December 31:					
Producer[9]	678	682	653	769	674
Consumer[10]	567	558	706	646	676
U.S. Government[2]	171	125	125	125	125
World, production of concentrate	68,400	73,900	76,500 r	83,300 r	86,800 e

eEstimated. rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

[1]Data are rounded to no more than three significant digits.

[2]Data from Defense Logistics Agency Strategic Materials.

[3]Annual average calculated from weekly prices reported by Platts Metals Week.

[4]Annual average calculated from semiweekly prices reported by Metal Bulletin.

[5]Price discontinued October 26, 2012.

[6]Reported by tungsten processors.

[7]Price discontinued July 18, 2012.

[8]Data for 2010–12 are annual averages calculated from semiweekly prices reported by Metal Bulletin. Data for 2013–14 are annual averages calculated from monthly prices reported by Metal Bulletin.

[9]Includes tungsten metal powder and tungsten carbide powder produced from metal powder; excludes cast and crystalline tungsten carbide powder and chemicals.

[10]Includes ammonium paratungstate and other tungsten chemicals, ferrotungsten, tungsten metal powder, tungsten carbide powder, and tungsten scrap.

TABLE 2
U.S. GOVERNMENT NATIONAL DEFENSE STOCKPILE TUNGSTEN STATISTICS IN 2014[1]

(Metric tons, tungsten content)

Material	Inventory, yearend		Annual	Sales		Inventory decrease[2]	
	Fiscal year[3]	Calendar year	Materials Plan[3]	Fiscal year[3]	Calendar year	Fiscal year[3]	Calendar year
Ores and concentrates	11,600	11,600	3,580	322	274	419	282
Tungsten metal powder	125	125	90	--	--	(4)	(4)
Total	11,800	11,800	3,670	322	274	419	282

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]From previous year.

[3]Twelve-month period ending September 30, 2014.

[4]Less than ½ unit.

Source: Defense Logistics Agency Strategic Materials.

TABLE 3
U.S. NET PRODUCTION AND STOCKS OF TUNGSTEN PRODUCTS[1, 2, 3]

(Metric tons, tungsten content)

	Tungsten metal powder	Tungsten carbide powder	Total
Net production:			
2013	W	W	6,150
2014	W	W	6,310
Producer stocks:			
December 31, 2013	W	W	769
December 31, 2014	W	W	674

W Withheld to avoid dislcosing company proprietary data.

[1]Net production equals receipts plus gross production minus quantity used to make other products listed.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Data for cast and crystalline tungsten carbide powder and tungsten chemicals are withheld to avoid disclosing company proprietary data; not included in "Total."

TABLE 4
U.S. PROCESSORS OF TUNGSTEN IN 2014[1]

Company	Plant location
Buffalo Tungsten Inc.	Depew, NY.
Chem-Met Co., The	Clinton, MD.
Elmet Technologies, Inc.	Lewiston, ME.
General Electric Co.	Euclid, OH.
Global Tungsten & Powders Corp.[2]	Towanda, PA.
Kennametal Inc.	Fallon, NV.
Do.	Huntsville, AL.[3]
Do.	Latrobe, PA.
Tundra Companies	White Bear Lake, MN.

Do. Ditto.

[1]Consumers of ammonium paratungstate, tungsten-bearing scrap, tungsten concentrates, and (or) tungsten oxides.

[2]A division of Plansee Group.

[3]Formerly ATI Alldyne (an Allegheny Technologies Inc. company).

TABLE 5
U.S. REPORTED CONSUMPTION AND STOCKS OF TUNGSTEN PRODUCTS[1, 2, 3]

(Metric tons, tungsten content)

	2013	2014
Consumption by end use:		
Steels	86	82
Superalloys	447	562
Other alloys[4]	W	W
Cemented carbides[5]	6,260	6,880
Mill products made from metal powder	W	W
Chemical	88	88
Total	10,700	11,600
Consumption by form:		
Ferrotungsten	97	107
Tungsten metal powder	W	W
Tungsten carbide powder	6,510	7,030
Tungsten scrap[6]	W	W
Other tungsten materials[7]	88	88
Total	10,700	11,600
Consumer stocks, December 31:		
Ferrotungsten	W	W
Tungsten metal powder	33	35
Tungsten carbide powder	412	417
Tungsten scrap[6]	W	W
Other tungsten materials[7]	13	13
Total	646	676

W Withheld to avoid disclosing company proprietary data; included in "Total."

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Does not include materials used in making primary tungsten products.

[3]Includes estimates.

[4]Includes welding and hard-facing rods and materials, wear- and corrosion-resistant alloys, and nonferrous alloys.

[5]Includes diamond tool matrices, cemented and sintered carbides, and cast carbide dies or parts.

[6]Includes tungsten bars.

[7]Includes tungsten chemicals.

TABLE 6
U.S. EXPORTS OF TUNGSTEN ORES AND CONCENTRATES, BY COUNTRY[1]

	2013			2014		
	Quantity			Quantity		
Country of destination	Gross weight (metric tons)	Tungsten content[2] (metric tons)	Value (thousands)	Gross weight (metric tons)	Tungsten content[2] (metric tons)	Value (thousands)
Brazil	2	1	$304	(3)	(3)	$68
Canada	2	1	30	4	2	54
China	759	392	11,400	217	112	3,780
Czech Republic	--	--	--	61	32	1,010
Germany	90	46	210	(3)	(3)	4
Hong Kong	180	93	2,490	66	34	1,290
Luxembourg	--	--	--	36	19	708
Malaysia	4	2	251	(3)	(3)	5
Netherlands	103	53	1,980	192	99	3,940
Poland	11	6	117	--	--	--
Russia	--	--	--	1,020	527	11,000
United Kingdom	38	19	549	--	--	--
Vietnam	861	444	16,000	792	409	12,700
Other	2	1	206	1	1	107
Total	2,050	1,060	33,600	2,390	1,230	34,700

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Content estimated from reported gross weight.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7
U.S. EXPORTS OF AMMONIUM PARATUNGSTATE, BY COUNTRY[1, 2]

	2013		2014	
Country of destination	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	(3)	$3	--	--
Austria	(3)	3	--	--
Czech Republic	49	1,070	--	--
Germany	516	8,640	495	$7,110
Hungary	101	1,690	96	1,480
India	28	251	49	436
Italy	1	13	2	22
Mexico	3	39	--	--
Switzerland	902	19,700	7	63
Taiwan	(3)	6	--	--
United Kingdom	1	10	3	31
Total	1,600	31,400	653	9,140

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes other ammonium tungstates, such as ammonium metatungstate.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. EXPORTS OF TUNGSTEN METAL POWDERS, BY COUNTRY[1, 2]

	2013			2014		
	Quantity			Quantity		
Country of destination	Gross weight (metric tons)	Tungsten content[3] (metric tons)	Value (thousands)	Gross weight (metric tons)	Tungsten content[3] (metric tons)	Value (thousands)
Australia	7	6	$281	2	1	$74
Austria	6	5	237	--	--	--
Belgium	2	2	71	1	1	94
Brazil	15	12	902	22	18	1,250
Cambodia	2	2	200	--	--	--
Canada	101	81	6,910	86	69	5,930
Chile	2	2	155	6	5	192
China	31	25	2,170	7	6	566
Ecuador	2	2	86	1	1	42
France	11	9	548	9	7	362
Germany	96	77	8,290	48	38	2,940
Hong Kong	2	2	243	14	11	602
India	38	30	2,750	47	37	2,250
Ireland	2	2	134	9	8	477
Israel	6	5	390	6	5	317
Italy	(4)	(4)	10	6	5	254
Japan	36	29	2,670	48	39	3,630
Korea, Republic of	4	3	388	5	4	336
Luxembourg	--	--	--	2	2	94
Mexico	10	8	753	13	10	866
Netherlands	9	7	350	7	5	358
Panama	4	3	154	2	1	70
Peru	1	1	47	7	6	432
Philippines	4	3	204	1	(4)	31
Saudi Arabia	95	76	4,630	93	75	5,770
Singapore	31	25	2,060	38	30	2,210
South Africa	6	4	558	10	8	869
Switzerland	10	8	627	2	2	160
Taiwan	18	14	1,520	6	5	428
Turkey	6	4	312	14	11	566
United Arab Emirates	1	1	139	3	3	331
United Kingdom	2	2	157	39	31	1,410
Venezuela	4	3	294	1	1	26
Other	5 r	4 r	353 r	6	5	318
Total	569	455	38,600	560	448	33,300

rRevised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]May include tungsten alloy powders.
[3]Content estimated from reported gross weight.
[4]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF TUNGSTEN CARBIDE POWDER, BY COUNTRY[1]

Country of destination	2013		2014	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	22	$973	32	$1,400
Austria	40	627	158	6,260
Belgium	2	209	1	74
Brazil	19	1,030	26	1,260
Canada	121	6,990	130	7,770
Chile	(2)	9	3	145
China	107	3,650	46	3,570
Czech Republic	43	2,010	54	1,460
Denmark	3	171	3	168
France	9	440	5	321
Germany	202	12,200	223	15,400
Hong Kong	2	148	3	270
India	36	2,040	24	2,470
Indonesia	4	215	3	164
Ireland	2	122	1	94
Israel	17	241	(2)	20
Italy	4	238	6	360
Japan	32	1,920	24	1,720
Korea, Republic of	5	517	15	1,250
Luxembourg	52	814	69	1,840
Malaysia	3	170	6	360
Mexico	13	1,290	12	874
New Zealand	1	35	2	64
Peru	1	108	6	405
Philippines	(2)	44	2	257
Saudi Arabia	10	431	5	291
Singapore	7	713	24	2,800
South Africa	7	346	13	678
Sweden	2	125	1	33
Switzerland	3	262	3	239
Taiwan	67	4,330	53	3,810
Thailand	2	147	4	329
United Arab Emirates	4	283	3	287
United Kingdom	41	2,280	23	1,870
Venezuela	16	1,110	(2)	8
Other	3 r	415 r	8	459
Total	901	46,700	993	58,800

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY[1]

Product and country of destination	2013 Quantity, tungsten content (metric tons)	2013 Value (thousands)	2014 Quantity, tungsten content (metric tons)	2014 Value (thousands)
Ferrotungsten and ferrosilicon tungsten:				
Brazil	6	$14	18	$44
India	2	4	--	--
Israel	--	--	2	5
Japan	4	88	--	--
Korea, Republic of	6	26	--	--
Mexico	3	224	2	201
Netherlands	9	299	10	603
Vietnam	--	--	42	18
Other	1	118	(2)	23
Total	31	774	76	893
Unwrought tungsten:[3, 4, 5]				
Australia	3	13	(2)	8
Austria	3	14	28	119
Belgium	13	53	--	--
Brazil	19	79	28	134
Bulgaria	5	20	--	--
Canada	552	2,440	470	2,040
China	14	71	10	62
Czech Republic	--	--	3	13
Germany	155	659	78	335
India	5	21	139	606
Indonesia	18	77	--	--
Italy	--	--	4	17
Japan	15	63	33	139
Korea, Republic of	3	11	18	77
Malaysia	3	11	--	--
Mexico	41	183	54	301
Netherlands	--	--	48	214
Panama	24	100	125	527
Russia	10	44	39	177
Singapore	173	737	110	462
Spain	--	--	5	25
Sweden	1	5	9	38
Switzerland	34	143	--	--
Taiwan	3	11	8	34
Thailand	20	87	8	34
United Arab Emirates	2	6	6	23
United Kingdom	35	149	39	166
Other	10 r	62 r	5	36
Total	1,160	5,060	1,270	5,590
Waste and scrap:[4]				
Australia	23	196	--	--
Austria	18	637	--	--
Belgium	47	397	16	136
Brazil	10	93	1	10
Canada	88	1,060	158	1,700
China	21	177	1	6
Finland	456	4,850	146	1,230
France	3	28	36	1,310
Germany	638	12,000	354	4,560
Hong Kong	109	920	41	806
India	1	5	3	25
Israel	59	844	602	5,480
Japan	131	1,670	43	467
Luxembourg	--	--	16	591

See footnotes at end of table.

TABLE 10—Continued

U.S. EXPORTS OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY[1]

Product and country of destination	2013		2014	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Waste and scrap[4]—Continued:				
Malaysia	--	--	7	$58
Netherlands	--	--	10	84
Poland	104	$2,570	54	1,800
Russia	--	--	19	157
South Africa	--	--	78	656
Sweden	70	594	--	--
Taiwan	4	30	15	167
United Kingdom	469	4,100	172	1,700
Other	4 r	37 r	1	5
Total	2,250	30,200	1,770	20,900
Wrought tungsten:[3, 4, 6]				
Australia	8	486	(2)	57
Austria	20	1,460	38	3,080
Brazil	3	668	3	1,220
Canada	42	6,220	23	3,050
China	22	1,740	8	1,300
Costa Rica	12	1,670	12	1,700
Germany	34	3,170	8	1,090
Hungary	2	401	12	2,020
India	34	4,000	8	851
Israel	1	159	18	2,130
Japan	13	1,820	10	1,320
Mexico	26	5,100	34	5,800
Singapore	8	1,080	4	954
United Kingdom	3	838	6	1,270
Other[7]	17 r	3,610 r	15	2,890
Total	246	32,400	201	28,800
Tungsten compounds:[8]				
Canada	2	7	6	22
China	1	10	3	190
Korea, Republic of	11	240	--	--
Malaysia	5	58	3	34
Other	(2)	35	--	--
Total	19	350	12	246

rRevised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Less than ½ unit.

[3]May include alloys.

[4]Content estimated from reported gross weight.

[5]Includes bars and rods produced simply by sintering; excludes powders and waste and scrap.

[6]Includes bars and rods other than those produced simply by sintering; profiles, plates, sheets, strip, and foil; wire; and other wrought products.

[7]Adjusted by the U.S. Geological Survey.

[8]Includes only other tungstates.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF TUNGSTEN ORES AND CONCENTRATES, BY COUNTRY[1]

Country of origin	2013		2014	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Australia	262	$9,060	158	$5,780
Bolivia	976	33,600	991	30,400
Brazil	24	745	22	718
Canada	1,140	33,300	1,140	38,200
China	(2)	17	13	341
Colombia	50	1,520	27	679
Germany	10	315	8	205
Italy	--	--	(2)	8
Mexico	14	355	10	108
Mongolia	--	--	115	3,900
Peru	--	--	51	1,750
Portugal	543	19,900	515	20,400
Russia	98	3,750	184	6,380
Rwanda	14	448	--	--
Singapore	8	265	--	--
Spain	464	16,200	741	26,500
Sweden	(2)	4	--	--
Thailand	76	3,180	86	2,660
Uganda	--	--	16	293
United Kingdom	14	406	--	--
Total	3,690	123,000	4,080	138,000

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS FOR CONSUMPTION OF AMMONIUM PARATUNGSTATE, BY COUNTRY[1, 2]

Country of origin	2013		2014	
	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
China	1,890	$72,600	1,250	$43,800
France	(3)	11	--	--
Germany	322	11,300	507	22,000
Japan	5	186	31	1,100
Total	2,220	84,200	1,780	66,900

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes other ammonium tungstates, such as ammonium metatungstate.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 13
U.S. IMPORTS FOR CONSUMPTION OF FERROTUNGSTEN AND FERROSILICON TUNGSTEN, BY COUNTRY[1]

	2013		2014	
Country of origin	Quantity, tungsten content (metric tons)	Value (thousands)	Quantity, tungsten content (metric tons)	Value (thousands)
Brazil	37	$1,370	--	--
China	327	13,400	284	$11,900
Hong Kong	15	690	--	--
Luxembourg	15	745	--	--
Netherlands	12	393	--	--
Sweden	1	30	--	--
Taiwan	--	--	16	675
Vietnam	63	2,620	155	6,280
Total	470	19,200	454	18,800

-- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 14
U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY[1]

Product and country of origin	2013 Quantity, tungsten content (metric tons)	2013 Value (thousands)	2014 Quantity, tungsten content (metric tons)	2014 Value (thousands)
Tungsten metal powders:[2]				
Austria	7	$453	5	$391
Canada	161	10,600	225	12,400
China	448	22,300	527	24,100
Czech Republic	9	415	13	574
Finland	--	--	3	173
France	3	69	1	106
Germany	172	11,100	103	6,360
Israel	123	8,670	100	10,500
Japan	7	592	12	1,440
Korea, Republic of	402	21,400	262	16,600
Poland	19	696	3	72
Singapore	40	2,570	1	129
United Kingdom	1	92	3	262
Vietnam	11	491	40	1,780
Other	3	224	1	104
Total	1,410	79,700	1,300	75,000
Tungsten carbide powder:				
Austria	135	8,340	105	6,230
Belgium	22	1,010	13	726
Canada	119	7,360	103	6,390
China	413	23,800	413	20,500
Czech Republic	9	511	6	278
France	12	1,220	18	1,680
Germany	81	6,170	190	12,200
India	--	--	12	307
Israel	16	1,650	45	3,950
Japan	2	187	3	215
Korea, Republic of	9	594	18	1,280
Luxembourg	--	--	13	185
Netherlands	5	22	--	--
South Africa	--	--	5	79
Vietnam	3	127	--	--
Other	2 r	211 r	2	149
Total	827	51,200	946	54,100
Unwrought tungsten:[2, 3, 4]				
Austria	16	1,040	7	478
China	281	13,300	223	10,600
United Kingdom	5	100	1	25
Vietnam	--	--	6	257
Other	3 r	98 r	1	65
Total	305	14,500	237	11,400
Waste and scrap:				
Austria	146	2,610	215	4,510
Canada	76	1,600	60	1,840
China	89	3,740	209	9,450
Czech Republic	25	852	57	1,890
Germany	78	2,430	248	7,270
India	93	2,450	108	3,950
Japan	23	638	27	842
Luxembourg	241	9,380	174	5,890
Mexico	223	4,590	247	5,660
Pakistan	--	--	46	1,430
Poland	41	987	108	3,780
Saudi Arabia	--	--	24	640

See footnotes at end of table.

TABLE 14—Continued
U.S. IMPORTS FOR CONSUMPTION OF MISCELLANEOUS TUNGSTEN-BEARING MATERIALS, BY COUNTRY[1]

Product and country of origin	2013 Quantity, tungsten content (metric tons)	2013 Value (thousands)	2014 Quantity, tungsten content (metric tons)	2014 Value (thousands)
Waste and scrap—Continued:				
Singapore	11	$128	19	$525
South Africa	36	1,010	--	--
Sweden	85	3,440	3	103
Taiwan	1	24	38	1,060
United Kingdom	46	1,220	26	606
Other	84 r	2,870 r	56	1,910
Total	1,300	38,000	1,660	51,400
Wrought tungsten[2, 3, 5]				
Austria	42	8,460	49	10,900
China	407	25,600	658	42,300
Germany	28	5,370	34	4,460
Hong Kong	--	--	3	119
Hungary	9	1,340	3	593
Japan	16	5,090	24	5,990
Korea, Republic of	3	330	2	220
Russia	4	559	9	1,090
Singapore	20	2,770	8	1,720
South Africa	7	238	3	142
Sweden	2	566	3	855
United Kingdom	3	668	2	1,050
Other	8	2,400 r	11	3,410
Total	548	53,400	809	72,900
Tungsten oxides:				
China	1,090	44,900	1,020	42,500
Germany	11	421	23	1,240
Korea, Republic of	17	703	--	--
Russia	43	2,200	--	--
Vietnam	31	1,220	45	1,820
Other	--	--	2	131
Total	1,190	49,400	1,090	45,700
Other tungstates:				
China	7	402	20	905
Germany	6	327	16	384
India	18	704	19	784
Ireland	3	225	--	--
Vietnam	169	5,520	341	10,200
Other	(6)	20	(6)	11
Total	204	7,200	396	12,300
Other tungsten compounds:[7]				
China	3	57	3	160
Germany	(6)	103	8	274
Japan	5	1,150	32	950
Other	1 r	28 r	1	326
Total	9	1,330	43	1,710

rRevised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]May include alloys.

[3]Content estimated from reported gross weight.

[4]Includes bars and rods produced simply by sintering; excludes powders and waste and scrap.

[5]Includes bars and rods other than those produced simply by sintering; foil, plates, profiles, sheets, and strip; wire; and other wrought products.

[6]Less than ½ unit.

[7]Includes tungsten chlorides.

Source: U.S. Census Bureau.

TABLE 15

TUNGSTEN: WORLD CONCENTRATE PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, tungsten content)

Country[3]	2010	2011	2012	2013	2014[e]
Australia	18	15	290	320	477 [4]
Austria	977	861	706	850	870
Bolivia[5]	1,204	1,124	1,247	1,253	1,252 [4]
Brazil	166	244	381	494 [r]	490
Burma[e, 6]	163 [4]	140	130 [r]	140	140
Burundi	100	200 [r]	270 [r]	55 [r]	170
Canada	420	1,966	2,194	2,128	2,344 [4]
China[e]	59,000	61,800	64,000	70,500 [r]	71,000
Congo (Kinshasa)[e, 5]	21 [r]	41 [r]	35 [r]	55 [r]	12
Korea, North[e, 7]	110	110	100	65	70
Mongolia	20	13	66	274 [r]	479 [4]
Peru[8]	571	439	276	28	61 [4]
Portugal	799	819	763	692	671 [4]
Russia	2,785	3,314	3,537	2,973 [r]	2,800
Rwanda[e]	360 [r]	480 [r]	830 [r]	1,100 [r]	1,000
Spain	240	497	542	510	800
Thailand[e, 9]	300	160	80	140 [r]	100
Uganda	44	8	34 [r]	57 [r]	70
United States	NA	NA	NA	NA	NA
Vietnam[10]	1,150	1,635	1,050	1,660	4,000 [4]
Total	68,400	73,900	76,500 [r]	83,300 [r]	86,800

[e]Estimated. [r]Revised. NA Not available.

[1]World totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes data available through November 13, 2015.

[3]Tungsten concentrates are thought to be produced in Colombia, Nigeria, and the Republic of Korea, but information is inadequate to make reliable estimates of production.

[4]Reported figure.

[5]Production estimated based on reported exports.

[6]Tungsten content of tungsten and tin-tungsten concentrates produced by state-owned mining enterprises under the Ministry of Mines.

[7]Production estimated based on Chinese imports.

[8]Data for 2010–12 are based on production reported by Malaga Inc.; data for 2013–14 are based on production reported by the Ministry of Energy and Mines.

[9]Based on data from the Department of Primary Industries and Mines.

[10]Mine production reported by the International Tungsten Industry Association.