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THE MINERAL INDUSTRY OF JAPAN

By John C. Wu

Japan is located in East Asia between the North Pacific Ocean and the Sea of Japan (East Sea) and east of the Korean Peninsula. The country's total area is 377,915 square kilometers, and its population as of August 2005 was estimated to be 127.76 million (Ministry of Internal Affairs and Communications, 2006§[1]). Japan's economy ranked second after the United States among the G7 major advanced economies and, in 2005, it had a gross domestic product (GDP) of $4.6 trillion ($3.9 trillion based on purchasing power parity); its per capita GDP was $35,757 ($30,615 based on purchasing power parity) (International Monetary Fund, 2006§).

Japan has limited indigenous mineral resources and relied heavily on imports of a wide variety of minerals and mineral products to meet the raw material requirements of its large manufacturing and utility (electricity and gas) sectors. The country, however, has substantial indigenous resources of dolomite, iodine, limestone, pyrophyllite, silica sand, and silica stone (table 3).

Japan's manufacturing and utility sectors were among the largest, in terms of capacity, in the world. The mineral industry processed imported raw materials and produced a broad category of mineral products, which included chemical compounds, construction materials, ferrous metals, fertilizer materials, industrial minerals, inorganic chemicals, nonferrous metals, petrochemicals, and refined petroleum products, for domestic consumption by the downstream industries in the construction and manufacturing sectors and for export to world markets. The electricity and gas industries used imported coal, natural gas, petroleum, uranium, and other nuclear fuel materials to produce electricity and processed natural gas to meet the energy requirements of the construction, manufacturing, mining, and other sectors of the economy.

In 2005, Japan was one of the world's top importers and consumers of primary aluminum, cadmium metal, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, gold metal, iron ore, ilmenite and rutile, indium metal, lead ore and metal, lithium metal, manganese ore and metal, magnesium, liquefied natural gas (LNG), nickel ore and metal, crude petroleum, platinum-group metals (PGM), phosphate rock, potash, rare earths, industrial salt, silicon metal, silver metal, tungsten ore and ammonium tungstate, tin metal, zinc ore and metal, and zircon. Japan was one of the world's major producers and exporters of fabricated aluminum and copper products, cement and cement products, ceramic products, refined copper, inorganic chemicals, compound fertilizers, electrolytic manganese dioxide (EMD), glass and glassware products, iodine, high-purity rare (minor) metals, iron and steel, and titanium sponge metal and titanium products.

[1]References that include a section mark (§) are found in the Internet References Cited section.

The mining sector was the smallest sector of Japan's industry-based economy. According to the Government statistics on real GDP by economic activities of Japan's national accounts, the mining sector accounted for only 0.11% of the real GDP in 2004 (the latest year for which data were available). The mineral industry, which included the mineral processing industries, accounted for 5.5% of the real GDP, as follows: processing of chemicals, 1.84%; of iron and steel, 0.86%; of fabricated metal products, 0.84%; of petroleum and coal products, 0.80%; of industrial mineral products, 0.68%; and of nonferrous metals, 0.37%; as well as mining, 0.11% (Economic and Social Research Institute, 2006b§).

The Japanese economy, as measured by the real GDP in 2000 constant prices, grew by 2.6% compared with 2.3% (revised) in 2004. The higher economic growth in 2005 was fueled by a 3.2% growth in private demand owing largely to a 7.7% increase in private nonresidential investment in plants and equipment (Economic and Social Research Institute, 2006a§).

Japan's industrial production, as measured by the indices of mining and manufacturing, increased by 1.1% in 2005 compared with 5.5% (revised) in 2004. The number of unemployed workers in Japan decreased to 2.94 million from 3.13 million (revised) in 2004, and the total labor force increased to 66.5 million from 66.4 million in 2004. As a result, the unemployment rate in Japan decreased to 4.4% from 4.7% in 2004. Japan's merchandise trade surplus dropped to $79.0 billion from $110.5 billion in 2004 mainly because of a substantial increase in the unit prices of imported raw materials. The change in Japan's consumer price index was a negative rate of 0.3% (0.3% deflation) in 2005 compared with a rate of 0% (no deflation or inflation) in 2004 (Japan Institute for Labor Policy and Training, 2006§).

Government Policies and Programs

To implement its mineral policies and undertake its mineral programs, the Japanese Government established Japan Oil, Gas and Metals National Corp. (JOGMEC) under the supervision of the Ministry of Economy, Trade, and Industry (METI) in February 2004 with the objective of securing a stable supply of natural resources and energy. To achieve this objective, JOGMEC provides assistance by offering its knowledge, information, and technological expertise to support Japanese companies at various stages between the acquisition of exploration and production rights and production; assumes responsibility for the management of the national stockpile of crude oil, liquefied petroleum gas (LPG), and rare metals; and supports activities to control domestic and overseas mine pollution. According to JOGMEC, for fiscal year 2006, which began on April 1, 2005, and ended on March 31, 2006, the Government budget for metals-related activities (excluding oil and gas) totaled about $61 million. JOGMEC's metals-related activities had about 200 professional staff members; 35 of

whom were geologists. The Metals Strategy & Exploration Unit of JOGMEC provides mineral resource information services, conducts domestic and overseas exploration and geologic surveys, finances domestic and overseas mineral exploration and development projects, supports technology development projects, administers stockpiling of rare metals (chromium, cobalt, manganese, molybdenum. nickel, tungsten, and vanadium), and conducts mine pollution control activities for domestic abandoned mines (Sakasegawa, 2006, p. 2-4).

To contribute to a stable supply of mineral resources for Japan and to accelerate mineral production and economic growth in developing countries, the former Metal Mining Agency of Japan started a mineral exploration program, which was called the Joint Basic Exploration Scheme (JBES) with an initial annual budget of $5 million in fiscal year 2003. JOGMEC continued the JBES program and increased its annual budget to about $11 million in fiscal year 2005 (Japan Oil, Gas and Metals National Corp., 2005).

The JBES' targeted commodities are, in order of priority, copper, zinc, nickel, platinum-group metals, and rare metals, which include such metals as cobalt, chromium, manganese, rare earths, tantalum, titanium, tungsten, and others. The potential joint-venture partners of the JBES include those state-owned mineral enterprises, regional government organizations, local geological survey agencies, private mining companies, multinational major mining companies, and junior mining companies that hold exploration licenses and have the power to sign and carry out the JBES contract terms. A typical JBES agreement includes a minimum work and expenditure commitment and farm-in arrangements for projects that are expected to last from 1 to 5 years. For any JOGMEC interest acquired through the joint-venture exploration, the agreement includes a provision that JOGMEC may transfer its interest to a proper successor after completion of the project period.

In 2005, JOGMEC's ongoing 15 JBES projects included one project in Argentina, two projects in Australia, one project in Brazil, three projects in Chile, three projects in Indonesia, one project in Mexico, three projects in Peru, and one project in Papua New Guinea. Most of the ongoing projects were joint ventures with Japanese and foreign private mining companies. JOGMEC's JBES budget was sourced from the METI; a typical annual budget for a JBES project was between $100,000 and $1 million. The budget cycle for each JBES project conforms to the Japanese fiscal year (Japan Oil, Gas and Metals National Corp., 2004; Sakasegawa, 2006, p. 12).

In August 2005, JOGMEC signed an agreement for a JBES project with Almaden Minerals Ltd. of Canada to jointly conduct exploration for copper, lead, silver, and zinc in the Sierra Madre Occidental area in Mexico. Under the agreement, the exploration project consists of a regional exploration program and exploration of the Santa Isabela property, which is located in Coahuila State, Mexico, and was owned by Almaden Minerals. The regional exploration program was to focus on extracting prospects and identifying new properties. For the regional exploration program, JOGMEC could acquire a 51% interest in the property by spending $700,000 for exploration by March 31, 2007, and could acquire a total of 60% by spending an additional $500,000 for exploration for each designed property. For the Santa Isabela program, JOGMEC could acquire a 51% interest by spending $1 million for exploration by March 31, 2007, and could acquire a total of 60% interest by spending an additional $500,000 for exploration by September 30, 2008 (Japan Oil, Gas and Metals National Corp, 2005§).

Environmental Issues

The amended Enforcement Order of Industrial Safety and Health Law, which largely prohibited the use of asbestos in Japan, took effect on October 1, 2004. As a result of the widespread use of asbestos in buildings as insulation and in roof tiles during the 1970s and the 1980s, Japan continued to suffer from asbestos-related deaths. According to the weekly reports in July 2005 by the Hong Kong-based Corporate Social Responsibility in Asia, several Japanese asbestos product-producing companies publicly disclosed that many of their employees and visitors to their factory premises had died of asbestos-related illnesses since the late 1970s. Numerous studies have linked asbestos exposure to lung cancer or mesothelioma, and pneumoconiosis. As of mid-2005, the companies that had publicly disclosed asbestos-related deaths included industrial equipment manufacturer Kubota Corp., building materials manufacturer Nichias Corp., ceramics and building materials manufacturer A&A Material Corp., and such major building materials producing companies as Asahi Glass Co. Ltd., Mitsubishi Materials Corp., Nozawa Corp., and Taiheiyo Cement Corp. (Corporate Social Responsibility in Asia, 2005a§, b§).

According to a press report by the Asahi Shimbun in September, the Government decided in August 2005 to draft legislation to extend relief to those who had suffered from asbestos-related health problems, including people who live near factories and factory worker's family members. The Government planned to make families of asbestos victims eligible for the same level of benefits as those available under workers' accident compensation insurance. The family would be able to receive payout even if they failed to apply for workers' accident compensation insurance within the legal limit of 5 years following the victims' deaths. The bill was expected to be submitted to an ordinary Diet (Parliament) session in 2006. To finance relief measures, the Government planned to seek contributions from asbestos-related businesses (Mines & Communities, 2005§).

In August, the Japanese Government announced that it had ratified the International Labor Organization Convention 162 on safety in the use of asbestos. The Government submitted the ratification instrument to the International Labor Office in Geneva, Switzerland, on August 10, 2005. The convention was expected to take effect in Japan on August 11, 2006. The convention specified the following measures to prevent health risks from asbestos: 1) promote the replacement of asbestos by other materials and the total or partial prohibition of the use of asbestos, 2) prohibit the use of the more-hazardous crocidolite (blue asbestos) and products that contain this fiber and the spraying of all forms of asbestos, 3) take adequate health and safety measures when demolishing structures that contain asbestos and when removing asbestos from buildings

or structures, and 4) take such measures to protect workers as setting exposure limits, monitoring the work environment, and providing workers with all necessary protection, health checkups, information, and education (Japan for Sustainability, 2005§).

Production

In 2005, mine production of all nonferrous metals (except gold) declined because of depleting ore reserves; production of most industrial minerals (except clays, dolomite, and nitrogen) increased. Mine production of lead, silver, and zinc at the Toyoha Mine in Hokkaido Prefecture decreased because of a sudden increase of water flow into the mine during April and May (Metals Place, 2005b§). Because of depleting ore reserves, the Toyoha Mine was scheduled to be closed by the end of March 2006 (Mining Journal, 2005b). Limestone production increased because of increased consumption by the cement and construction industries. Japan's coal output decreased owing to closure of four small-scale coal mines early in the year. According to Japan Coal Energy Center, less than seven small-scale open pit coal mines and one major underground coal mine operated in Hokkaido Prefecture in 2005 (Japan Coal Energy Center, 2005). The output of crude petroleum and natural gas continued to increase but remained insignificant when compared with Japan's requirements.

In the mineral-processing sector, production of refined copper, gold, rare-earth oxides, tin, titanium, and zinc increased but production of other nonferrous metals, such as antimony oxide, chromium metal, lead, nickel, silver, and tungsten, decreased. Production of crude steel also decreased but remained at about the same level [(120 million metric tons (Mt)] as that of 2004 owing to the stronger domestic demand for the manufacture of automobiles and increased exports to Taiwan and Thailand. Production of titanium sponge metal continued the upward trend begun in 2004 owing to increased domestic demand and increased exports to the United States. Production of cement and other construction-related materials was higher than that of 2004 because of increased demand for the construction of dwellings and of such buildings as factories, plants, and warehouses. Production of most refined petroleum products was higher in 2005 because of increased domestic demand for gasoline, distillate fuel oil, kerosene, LPG, and naphtha (table 1).

Trade

Japan remained a net importer of minerals because of its large import bills for mineral fuels. Japan's mineral trade deficit increased to $172.7 billion from $98.6 billion in 2004. The sharp increase in the 2005 mineral trade deficit was caused mainly by a 34% increase in import bills for mineral fuels and a 41% increase in import bills for ferrous and nonferrous metal ores (table 4).

In 2005, Japan's total imports of minerals increased by 56.5% to $232.1 billion and accounted for 44.9% of the total imports, which were valued at $516.8 billion. The higher import bills for minerals was a direct result of higher import unit prices of all minerals, especially for such raw materials as ferrous and nonferrous metal ores, crude petroleum, and LNG. Of the $232.1 billion worth of mineral imports, $133.4 billion (57.5%) was for such mineral fuels as coal, LNG, crude petroleum, partially refined petroleum, refined petroleum products, and other mineral fuels; $14.4 billion (6.2%), for ores and concentrates of ferrous and nonferrous metals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and $1.5 billion (0.7%), for such industrial minerals as cement, earths and stone, lime, plastering materials, salt, and sulfur. Imports of processed minerals, mineral-related chemicals, and metals totaled $41.8 billion, of which $23.8 billion was for products of iron and steel and nonferrous, rare, and other base metals; $8.4 billion, for precious and semiprecious stones and precious metals; $5.5 billion, for mineral-related chemicals and fertilizers; and $4.1 billion, for articles and products of asbestos, cement, ceramics, glass, mica, and stone (Ministry of Finance, 2005b, p. 9-13, 15-16, 34-41).

The total exports of minerals, mineral-related chemicals, and processed mineral products increased by 19.6% to $59.5 billion in 2005 and accounted for 10% of Japan's total exports, which were valued at $595.8 billion. Exports of iron and steel products and nonferrous, rare, and other base metals totaled $42 billion. Exports of processed mineral articles and products of asbestos, cement, ceramics, glass, mica, and stone were valued at $6.4 billion. Exports of cement, earths and stone, mineral fuels, lime, ferrous and nonferrous metal ores, plastering materials, salt, and sulfur were valued at $5 billion. Exports of mineral-related chemicals and fertilizer were valued at $3 billion. Exports of precious and semiprecious stones and precious metals were valued at $3 billion (Ministry of Finance, 2005a, p. 9-13, 15-16, 34-41).

Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining sector of industrial minerals, and a large mineral-processing sector of ferrous and nonferrous metals and industrial minerals (table 2). Mining and mineral-processing businesses were owned and operated by private companies incorporated in Japan.

In the mining sector, the number of major nonferrous metal mines remained at two in 2005. The major industrial mineral mines (mostly limestone quarries) totaled about 40. The coal mining sector consisted of seven small-scale open pit mines and one major underground mine (Kushiro) in Hokkaido Prefecture.

Japan's mining capacity of nonferrous metals (mainly lead, silver, and zinc) and coal continued to decline in 2005. The number of persons employed by the mining sector dropped to 30,000 in 2005 from 40,000 in 2004 (Statistical Handbook of Japan, 2006§).

In the mineral-processing sector, the iron and steel industry's employees increased to 157,512 from 154,578 at the end of 2004. The industry's production capacity of pig iron increased to 83.34 million metric tons per year (Mt/yr) from 82.00 Mt/yr at the end of 2004, and the production capacity of crude steel also increased to 124.12 Mt/yr from 120.79 Mt/yr at the end of 2004. In the nonferrous metals industry (which included smelting and refining of copper, gold, lead, silver, zinc, and other minor

metals), the total number of employees decreased to 5,105 from 5,148 at the end of 2005. In 2005, Japan's production capacity of refined copper increased by 6.4% to 1,554,000 metric tons per year (t/yr); refined gold remained unchanged at 186 t/yr; refined lead remained unchanged at 275,000 t/yr; refined silver remained unchanged at 2,800 t/yr; and refined zinc remained unchanged at 750,000 t/yr. Japan's cement industry cut the number of its regular employees by 1.07% to 3,313 and held its cement clinker capacity unchanged at 76.0 Mt/yr during 2005 (Ministry of Economy, Trade and Industry, 2005a, p. 127, 130; 2005c, p. 107-108, 162, 164).

Commodity Review

Metals

Antimony.—Japan relied on imports to meet all its raw material requirements for the production of antimony trioxide and metal. The main use of antimony trioxide was for making flame retardants and chemicals; the main use of antimony metal was for making batteries, specialty steel, and hard lead casting.

In 2005, Japan imported 40 metric tons (t) of antimony ore and concentrate from China and 10 t from Vietnam; 220 t of antimony oxide from China; and 7,635 t of antimony trioxide mainly from China (89.0%), Mexico (7.8%), and Taiwan (2.4%). The import bills for antimony ore, oxide, and trioxide totaled $24.4 million (Ministry of Finance, 2005b, p. 171, 184).

Nihon Seiko Co. Ltd. was Japan's leading producer of antimony trioxide and accounted for more than 71.5% of total antimony trioxide production. Other antimony trioxide producers were Toko Sangyo Co. Ltd. and Yamanaka Sangyo Co. Ltd. Toko Sangyo was Japan's leading antimony metal producer and accounted about 90% of total antimony metal production. The other producer of antimony metal was Nihon Seiko.

Domestic demand for antimony metal totaled 455 t in 2005, of which 209 t was for the production of specialty steel; 114 t, for storage batteries; 47 t, for hard lead casting; and 85 t, for other uses (Ministry of Economy, Trade and Industry, 2005c, p. 278). Antimony trioxide was used as a flame retardant additive (93%) in fibers, plastics, and rubbers; and as pigment and for other uses (7%) (Arumu Publishing Co. Ltd., 2006, p. 54). High-purity antimony metal that contained between 99.9% and 99.999% Sb was used as raw material for semiconductors, in film for optical memory disks, and in thermoelectron converters. Antimony metal that contained between 97% and 99% Sb was used in making antimony alloys for storage batteries, for bearing metals for hard lead castings, cable sheathing, type-metals, sheet and pipe alloys, and for glass fining agents and alloys (Nihon Seiko Co. Ltd., 2006a§, b§).

In 2005, Japan exported 254 t of antimony metal mainly to Taiwan (95%) and Thailand (4%). Exports of 2,151 t of antimony oxides went mainly to Thailand and Malaysia (12.3% each), Singapore (12.0%), the Republic of Korea (11.5%), China (10.9%), Indonesia (9.9%), Taiwan (8.8%), and the United States (8.1%). Export earnings from antimony oxides and metal were valued at $11.9 million and $605,200, respectively (Ministry of Finance, 2005a, p. 116, 595).

Bauxite and Alumina and Aluminum.—In 2005, Japan relied 100% on imports of bauxite for the production of alumina and aluminum hydroxide. Imports of bauxite decreased by 6.8% to 1.8 Mt and were valued at $70.5 million in 2005. The major supplying countries of bauxite were Australia (44.7%), Indonesia (37.3%), and India (13.4%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture, which had the capacity to produce 365,000 t/yr of aluminum hydroxide and 163,000 t/yr of alumina; Showa Denko K.K. (SDK) at its Yokohama plant in Kanagawa Prefecture, which had the capacity to produce 220,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina; and Sumitomo Chemical Co. Ltd. at its Ehime plant in Ehime Prefecture, which had the capacity to produce 200,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina (Japan Aluminum Association, 2003, p. 11).

Production of primary aluminum (unwrought aluminum) by NLM at the Kambara smelter in Shizuoka Prefecture increased slightly to 6,500 t from 6,400 t in 2004, but the amount was insignificant compared with Japan's annual requirements for primary aluminum. In 2005, imports of primary aluminum decreased by 1.5% to 2.98 Mt and were valued at $3.8 billion, of which 1.99 Mt was ingot and 989,418 t, alloys (Ministry of Finance, 2005b, p. 672-673).

More than 46% of the total primary aluminum imports came from Japan's overseas aluminum smelter projects in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, and Venezuela. Japan imported primary aluminum and aluminum alloy from more than 57 countries worldwide. Among those countries, the major suppliers were Russia (25.1%), Australia (18.9%), China (10.7%), Brazil (7.6%), New Zealand (7.2%), South Africa and Canada (5.4% each), Indonesia (5.1%), and United Arab Emirates and Venezuela (3.5% each). The United States supplied only 8,106 t and accounted for less than 0.3% of Japan's imports of primary aluminum and aluminum alloys (Ministry of Finance, 2005b, p. 672-673).

Consumption of primary aluminum totaled about 2.28 Mt, of which about 1.8 Mt was for aluminum rolled products and the remainder was for die-casting, wire and cable, and other products. Exports of primary aluminum totaled 34,420 t, of which aluminum ingots accounted for 12,936 t, and aluminum alloys, 21,483 t. The total exports were valued at $73.1 million. The major buyers of aluminum ingot were Thailand (72.8%), Vietnam (12.4%), and China (9.7%). The major buyers of aluminum alloys were the Republic of Korea (21.2%), Australia (15.7%), China (15.4%), Vietnam (12.1%), Indonesia (9.9%), Saudi Arabia (7.1%), and the Philippines (5.7%) (Ministry of Finance, 2005a, p. 584).

According to the Japan Aluminum Association, overall demand (domestic demand and exports) for aluminum products increased to 4.35 Mt from 4.33 Mt in 2004. Domestic demand for aluminum products by end-use in 2005 was as follows: 38.2% for transportation, 15.4% for building and construction, 11.8% for fabricated metal, 10.5% for food packaging, 3.8% each for communication machinery and industrial machinery, and 10.9% for others; 5.6% was for exports (Japan Aluminum Association, 2006§).

Chromium.—Japan relied on imports to meet all chromium ore and concentrate requirements for the production of ferrochromium and chromium metal powder. Japan's imports of chromium ore and concentrate dropped by 61.7% to 104,004 t and were valued at $21.8 million in 2005. The major suppliers were India (53.4%), South Africa (25.1%), and Pakistan (11.9%) (Ministry of Finance, 2005b, p. 171).

Domestically produced ferrochromium continued the 2001 downward trend and decreased by 8% to about 12,400 t in 2005 owing to the shutdown of JFE Steel Corporation's East Japan Refinery in Chiba Prefecture because of environmental problems and increased imports of high-carbon ferrochromium. In 2005, imports of ferrochromium increased by 4.3% to 1,019,500 t and were valued at $950 million. The major overseas suppliers of ferrochromium were South Africa (50.9%), Kazakhstan (27.3%), Zimbabwe and India (6.2% each), Russia (4.9%), and China (3.8%) (Ministry of Finance, 2005b, p. 630).

In April 2005, SDK announced that it had decided to withdraw from Middelburg Technochrome (MTC) and would sell its shares in MTC. MTC had been established as a joint venture of Samancor Ltd. (65.5%) of South Africa and SDK (20.7%) and Marubeni Corporation (13.8%) of Japan for the production of low-carbon ferrochromium in 1995. According to SDK, MTC's financial performance had deteriorated substantially since 2003 because of the sharp appreciation of the South African Rand. Based on an agreement signed on March 31, 2005, SDK was to dissolve the joint-venture agreement and to transfer its shares in MTC to Samancor Ltd. SDK was expected to withdraw completely from the ferroalloys business and to form a group of inorganic materials companies (Showa Denko K.K., 2005§).

Consumption of ferrochromium increased by 1.6% to 922,800 t, of which 874,700 t was high-carbon ferrochromium and 48,100 t, low-carbon ferrochromium (Ministry of Economy, Trade and Industry, 2005c, p. 216). Exports of ferrochromium increased by 34.6% to 3,495 t, of which 3,430 t was low-carbon ferrochromium and 65 t, high-carbon ferrochromium. Export earnings of ferrochromium were $9.7 million in 2005. The principal buyers of low-carbon ferrochromium were the United States (90%) and Thailand (8%). The principal buyers of high-carbon ferrochromium were Indonesia (47.5%) and the Republic of Korea (29.3%) (Ministry of Finance, 2005a, p. 501).

In 2005, the sole producer of chromium metal was Nippon Denko Co. Ltd., which operated an 800-t/yr plant at Oshima in Toyama Prefecture; the plant used the aluminothermic reduction method. Nippon Denko produced about 700 t chromium metal in 2005. No chromium metal production was reported by JEP Materials in 2005. To supplement the domestic chromium metal production shortfall in 2005, Japan imported 4,498 t of chromium ingot and powder, which was worth $48 million, to meet its demand for chromium metal. The major suppliers were China (61.9%), the United States (16.0%), France (10.9%), and the United Kingdom (7.8%) (Ministry of Finance, 2005b, p. 681; Roskill's Letters from Japan, 2006a).

In Japan, chromium metal was consumed mainly for the manufacture of electronic materials, heat-resisting steel, and super alloys. In 2005, domestic consumption of chromium metal was estimated to be 4,500 t, of which about 60% was for making superalloys; about 20%, for nonferrous alloys; and the remaining 20%, for making welding rods and other materials. In 2005, Japan exported 558 t of chromium ingot and powder, which was worth $14 million. The major buyers were the United States (53.1%) and the United Kingdom (37.1%) (Ministry of Finance, 2005a, p. 595).

Copper, Lead, and Zinc.—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's only lead and zinc mining company. In 2005, the mine produced 299,000 t of ore, and the mill produced 41,452 t of zinc and 3,437 t of lead in concentrates; the mine also produced about 54 t of byproduct silver, an estimated 15 to 20 t of byproduct indium, and a small amount of copper. In 2005, Japan relied on imported ores and concentrates for 88% of its copper smelters' and refineries' raw materials requirements, 47% of its lead smelters' and refiners' raw material requirements, and 77% of its zinc smelters' and refineries' raw material requirements (Ministry of Economy, Trade and Industry, 2005d, p. 136; Japan Mining Industry Association, 2006, p. 63, 78. 92, 134, appendix p. 15-16).

Japan was one of the world's major importers of copper, lead, and zinc concentrates. Imports of copper concentrate, in gross weight, declined by 3.1% to 4.3 Mt in 2005. Despite the reduced import volume, the import bills of copper ore and concentrates increased by 26.3% to $4.8 billion because of increased import unit prices. The major suppliers of copper concentrate were Chile (44.8%), Indonesia (19.1%), Australia (9.9%), Canada (9.0%), Papua New Guinea (6.5%), and Peru (5.7%) (Ministry of Finance, 2005b, p. 170).

Imports of lead ore and concentrates (in gross weight) increased by 22% to 171,606 t. The import bills of lead ore and concentrates increased by 31% to $135.3 million. The major suppliers of lead ore and concentrate were the United States (47.8%), Australia (37.5%), and Peru (6.4%). Imports of zinc ore and concentrates (in gross weight) decreased by 7.2% to 1.04 Mt. The import bills for zinc ore and concentrates increased by 27% to $434 million. The major suppliers of zinc ore and concentrate were Australia (35.8%), Peru (16.4%), the United States (14.6%), Bolivia (10.9%), Canada (6.1%), Russia (4.1%) and Chile (3.9%) (Ministry of Finance, 2005b, p. 170).

On March 22, 2005, Sumitomo Metal Mining Co. Ltd. (SMM) and Sumitomo Corp. (SC) jointly announced that they had executed the definitive agreements with Compania de Minas Buenaventura S.A.A. (Buenaventura) of Peru and Phelps Dodge Corp. (PDC) of the United States to acquire an equity position in Sociedad Minera Cerro Verde S.A.A. (Cerro Verde), which operated a copper mine near Arequipa, Peru. The agreements were made to enable SMM and SC to secure more captive copper concentrate from overseas nonferrous metals mines to meet the raw materials requirements of SMM copper smelter's production capacity, which would be expanding to 365,000 t/yr by July 2005, to 410,000 t/yr by early 2006 and, ultimately, to 450,000 t/yr by March 2008 (table 8). Before March 2005, Phelps Dodge had owned 82.5% of Cerro Verde's outstanding shares, Buenaventura had owned 9.2%, and the remainder was publicly traded on the Lima Stock Exchange. On June 6, SMM and SC jointly announced the completion of their acquisition

of a 21% equity interest in Cerro Verde for $265 million. SMM and SC would purchase 50% of Cerro Verde's copper concentrate production during the first 10 years and, after 10 years, the purchase amount would be reduced to 21%, which is equal to its equity interest. According to SMM, Cerro Verde produced about 90,000 t/yr of copper cathode. Upon completion of the expansion in early 2007, the mine would produce copper ore and concentrate that contained about 180,000 t/yr of copper (Sumitomo Metal Mining Co. Ltd., 2005d§, e§)

On June 1, 2005, SMM and SC jointly announced that they had reached an agreement in principle with PDC to acquire an equity position in Compania Contractual Minera Ojos del Salado (Ojos del Salado Mine), which was 100% owned by PDC. The underground copper mine, which is located about 4 kilometers (km) northeast of Candelaria copper mine near Tierra Amarilla in north central Chile, produced about 60,000 t/yr of copper concentrate that contained about 18,000 t/yr of copper. Under the agreement, SMM and SC would jointly obtain a 20% interest in the Ojos del Salado copper mining operation and the associated exploration properties in the Punta del Cobre District, which were owned by PDC. SMM and SC had agreed to invest $25 million to acquire a 20% interest by subscribing in new shares of Ojos del Salado. SMM would hold 16% (80% of the 20% equity position) and SC, 4% (20% of the 20% equity position) in Ojos del Salado. Under the agreement, SMM and SC would have the right to purchase at least 20% of the copper concentrate produced from the Ojos del Salado Mine and future production from the Punta del Cobre District (Sumitomo Metal Mining Co. Ltd., 2005h§).

On October 4, 2005, SMM and SC jointly announced that they had reached an agreement with PDC to restart the idled copper concentrator and to construct a concentrate leaching facility to produce copper cathode at the Morenci copper mine site in Arizona; the complex was operated by the Morenci Mining Joint Venture, which was a joint venture of PDC, SMM, and SC. About $210 million had been approved for the project, which was scheduled to begin operation in 2007. SMM and SC would spend about $31 million, which was approximately equivalent to their 15% joint interest in the Morenci Mining Joint Venture (Sumitomo Metal Mining Co. Ltd., 2005c§).

In 2005, Japan's metal production of copper increased by 1.1% mainly because of a 30% increase in exports of refined copper. Metal production of refined lead decreased by 3.1% owing to a 20% decrease in domestic demand despite a 50% increase in exports of refined lead. Metal production of slab zinc increased by 1.2% despite a 4% decline in domestic demand and a 13% decline in exports of slab zinc; the overall stock of slab zinc increased by 37% during the year.

SMM continued to undertake its copper expansion project at the Toyo smelter and refinery complex at Saijyo, Ehime Prefecture. The copper-refining capacity was raised to 365,000 t/yr in June 2005 and was expected to be increased further to 410,000 t/yr in fiscal year 2006. The acquisition of a 16.8% equity interest in the Cerro Verde copper mine in Peru was part of the company's basic strategy to secure more than 60% of the captive copper ore and concentrate to feed the planned increase in the refined copper production capacity at the Toyo Smelter. For the next 10 years starting in fiscal year 2006, SMM would take 90,000 t of copper contained in copper concentrate from the Cerro Verde copper mine (Sumitomo Metal Mining Co., Ltd., 2005a§, p. 17).

On June 16, 2005, SMM announced that it had successfully developed a new hydrometallurgical technology to process chalcopyrite concentrate at its Niihama Research Laboratories in Niihama City, Ehime Prefecture, and that its viability had been confirmed through continuous testing at a pilot plant. In the past, chalcopyrite ore, which could not be processed by heap leaching nor solvent extraction and electrowinning, normally was processed by a pyrometallurgical refining method, which converted chalcopyrite ore to concentrate by flotation and then processed it by pyrometallurgical refining. SMM's newly developed hydrometallurgical copper refining process uses SMM's own chlorine refining technology for matt chorine leach electrowinning (MCLE), which was originally developed by SMM for its nickel refining. This technology not only helps in the processing of chalcopyrite copper concentrate by significantly improving reaction efficiency but also is cost effective and makes it possible to process a wider array of copper ores to recover iron as metal, and to effectively recover precious metals (Sumitomo Metal Mining Co. Ltd., 2005g§).

On December 26, 2005, Mitsui Mining and Smelting Co. Ltd. and Nippon Mining & Metal Co. Ltd. jointly announced that Nippon Mining & Metals would spin off its copper refining operations in Saganoseki, Oita Prefecture, and in Hitachi, Ibaraki Prefecture, to Pan Pacific Copper Co. Ltd. and that Mitsui Mining and Smelting also would transfer its copper refining operation in Tamano, Okayama Prefecture, to Pan Pacific Copper. As a result, Pan Pacific Copper would have a combined refining capacity of 678,000 t/yr of refined copper beginning in 2006. Pan Pacific Copper was established in 2001 by Nippon Mining & Metals (66%) and Mitsui Mining and Smelting (34%) to sell refined copper. In 2002, the two companies announced that they would fully integrate their copper businesses by strengthening the collaboration of their copper smelting and refining operations to promote timely response to the changing business environment and to strengthen their international competitiveness. By December 2005, Pan Pacific Copper was procuring copper ore and concentrate from overseas and was consigning refining to its parent companies for sale (Metals Place, 2005d§; Nippon Mining & Metals Co. Ltd., 2005§).

In December 2005, Dowa Mining Co. Ltd. and Mitsubishi Materials Corp. announced in their press releases that they would invest about $80 million (¥8.1 billion) to build a new furnace at the companies' joint-venture copper smelter—Onahama Smelting and Refining Co. Ltd., which was located in Onahama, Fukushima Prefecture. The new furnace, which was expected to boost the copper ore processing capacity by 25%, was scheduled to begin operation in November 2007 (Metals Place, 2005c§).

Imports of refined copper decreased by 16% to 74,100 t and were valued at $276.6 million in 2005. The major suppliers of refined copper were Chile (46.6%), Peru (22.9%), the Republic of Korea (7.9%), Zambia (5.1%), Australia (4.7%), and Thailand (4.5%). Imports of refined lead increased sharply by 83.6% to 19,060 t and were valued at about $26.2 million. The dominant

supplier of refined lead was China (98.6%). Imports of slab zinc (refined zinc) increased by 8.2% to 45,860 t and were valued at about $64 million. The major suppliers of zinc slab were Peru (37.3%), China (28.7%), Namibia (22.2%), Canada (6.4%), and Australia (2.2%) (Ministry of Finance, 2005b, p. 666, 677).

Demand for refined copper decreased by 2.4% to 1.2 Mt in 2005. Demand for refined copper, by sector, was 751,600 t for wire and cable, 433,500 t for brass mill products, and 14,100 t for others (Ministry of Economy, Trade and Industry, 2005c, p. 268). Exports of refined copper increased by 27.3% to 247,700 t and were valued at $910.1 million. The buyers of refined copper were Taiwan (42.4%), China (37.1%), the Republic of Korea (11.3%), the United States (2.5%), Indonesia (2.4%), Malaysia (1.5%), Thailand (1.3%), and other countries (1.5%). Exports of unrefined copper and copper anodes increased by 45.3% to 11,800 t and were valued at $48.3 million. Unrefined copper and copper anodes were exported mainly to the Republic of Korea (46.6%), Taiwan (20.1%), China (12.5%), and Hong Kong (10.5%) (Ministry of Finance, 2005a, p. 575, 576).

In 2005, the demand for refined lead decreased by 20.3% to 141,400 t, of which 107,500 t was for storage batteries; 18,600 t, for inorganic chemicals; 6,000 t, for solder; 2,500 t, for lead pipe and sheet; and 6,800 t, for other uses (Ministry of Economy, Trade and Industry, 2005c, p. 270). Exports of refined lead increased by 50% to 4,240 t and were valued at $3.7 million. The major buyers of refined lead were Hong Kong (57.2%), Indonesia (21.6%), Malaysia (12.4%), China (6.2%), and the United States (5.4%) (Ministry of Finance, 2005a, p. 589).

Demand for slab zinc decreased by 3.9% to 457,700 t, of which 218,800 t was for galvanized sheet; 74,400 t, for other galvanizing; 62,300 t, for brass mill products; 45,850 t, for die-cast alloy; 23,700 t, for inorganic chemicals; and 32,650 t, for other uses (Ministry of Economy, Trade and Industry, 2005c, p. 274). Exports of zinc slab decreased by 13% to 53,700 t and were valued at $74.5 million. The major buyers were Taiwan (40.6%), Indonesia (29.3%), Vietnam (10.8%), the Philippines (8.9%), Malaysia (2.7%), Bangladesh (2.4%), and Thailand and Cambodia (1.6% each) (Ministry of Finance, 2005a, p. 590).

Gold and Silver.—Mine production of gold was mainly by SMM from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko, Sanjin, and Yamada deposits in the Hishikari mining area, produced about 185,000 t of ore that averaged 40.6 grams per metric ton (g/t) gold in 2005 (Japan Mining Industry Association, 2006, p. 134). Other small-scale gold and silver mines were the Arkesi and the Kasuga in Kagoshima Prefecture. Toyoha Mining produced most of Japan's mined silver as a byproduct of lead and zinc mining operations from the Toyoha Mine in Hokkaido Prefecture. Japan's overall mine production of gold and silver was about 8,320 kilograms (kg) and 54,100 kg, respectively (Ministry of Economy, Trade and Industry, 2005d, p. 136).

In May 2004, SMM and its partners SC and Teck Cominco Ltd. of Canada began construction of the Pogo gold mine in Alaska. The construction was going well in 2005. The total capital cost, however, had been revised twice to $357 million in October 2005 from $321 million in March 2005 as compared with the original estimate of about $280 million in 2004 owing to higher than expected equipment, steel, fuel, contractor, and labor costs in Alaska. The target date for operations to begin was March 2006. The Pogo gold mine was claimed by SMM as one of the highest quality gold deposits in the world with an estimated resource of 152 t of gold. The company estimated that gold production would total 12 t/yr, of which SMM would receive 6.12 t/yr for approximately 10 years. The Pogo joint-venture project, which is located about 145 km southeast of Fairbanks, Alaska, was owned by Sumitomo Metal Mining America Inc. (a wholly owned subsidiary of SMM), 51%; Teck Cominco, the project operator, 40%; and SC Minerals America, Inc. (a wholly owned subsidiary of SC), 9% (Sumitomo Metal Mining Co. Ltd., 2005a§, f§).

In 2005, metal production of primary gold increased by about 7%. Metal production of primary silver, however, decreased by 0.2% owing to a reduced supply of raw materials and scrap inputs from domestic sources at silver refineries. Imports of gold (ingot and powder) increased by 1.6% to 71,542 kg and were valued at $1,065 million. The major suppliers of gold ingot and powder were Switzerland (40.7%), Australia (24.9), the United States (15.3%), Uzbekistan (9.0%), Hong Kong (4.5%), Canada and Russia (1.4% each), and Belgium (1.3%). Imports of silver (ingot and powder) decreased by 24.9% to 1,288 t and were valued at $301 million. The major suppliers of silver ingots and powder were the Republic of Korea (35.3%), Mexico (20.2%), Australia (17.1%), Peru (12.6%), the United States (10.9%), and China (1.2%) (Ministry of Finance, 2005b, p. 624).

In 2005, the demand for gold, which included dental, medical, electrical, and electronic uses, industrial arts and crafts, jewelry, and private investment, increased by 2.9% to 298,000 kg from 289,600 kg in 2004. The demand for gold by end use was for dental and medical, which decreased to 20,900 kg from 21,400 kg in 2004; electrical, electronic, and communication apparatus, which increased to 100,700 kg from 86,300 kg; private hoarding, which increased to 81,000 kg from 80,500 kg; gold plating, which decreased to 20,100 kg from 23,600 kg; jewelry, which increased slightly to 20,500 kg from 20,200 kg; industrial arts and crafts, which increased to 4,800 kg from 4,700 kg; pottery and porcelain, which held steady at 1,420 kg; decorations and badges, which decreased to 1,200 kg from 1,400 kg; and other uses, which decreased to 46,700 kg from 49,300 kg (table 5). Among the end users, demand for jewelry reversed its downward trend for the first time in more than 10 years (Arumu Publishing Co. Ltd., 2006, p. 125).

Demand for silver decreased by 16.1% to 2,179 t in 2005. Demand for silver by end use was for silver nitrate used for photography, 969 t; for silver nitrate used for other purposes, 299 t; for electrical contacts, 209 t; for rolled products, 214 t; for brazing alloy (silver solder), 102 t; and for other uses, 386 t (table 5) (Ministry of Economy, Trade and Industry, 2005c, p. 288).

Exports of gold ingot and powder increased by 80.4% to 20,253 kg in 2005 and were valued at $296.1 million. The major buyers of refined gold ingot and powder were the United Kingdom (46.8%), Hong Kong (27.3%), Thailand (7.8%), the United Arab Emirates (7.4%), Singapore (5.4%), and China (2.9%). Exports of silver ingot and powder increased by 72.1%

to 1,119.4 t in 2005 and were valued at $72 million. The major buyers of refined silver and powder were India (21.9%), China (19.8%), Singapore (11.6%), Taiwan (10.3%), the Republic of Korea (9.6%), the United States (8.0%), Hong Kong (6.1%), the United Kingdom (4.5%), and Denmark (3.1%) (Ministry of Finance, 2005a, p. 497).

Iron and Steel.—Japan relied on imports to meet all the iron ore requirements of its iron and steel industry. In 2005, imports of iron ore decreased by 1.9% to 132.3 Mt and were valued at $5.59 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore was $42.23 per metric ton compared with $29.56 per ton in 2004. The major suppliers of iron ore were Australia (61.5%), Brazil (20.9%), India (7.9%), South Africa (4.0%), and the Philippines (2.8%). Imports of pig iron increased by 73.5% to 1,038,981 t and were valued at $324.57 million. The average c.i.f. import price of pig iron was $312.33 per ton compared with $291.86 per ton in 2004. The major suppliers of pig iron were China (81.6%), Taiwan (6.6%), Brazil (5.5%), North Korea (3.1%), South Africa (1.6%), and Russia (1.3%) (Ministry of Finance, 2005b, p. 170, 630).

In securing the long-term supply of iron ore, Companhia Vale do Rio Doce (CVRD) of Brazil and Nippon Steel Corp. reached an agreement in February 2005 to increase the free-on-board (f.o.b.) prices of Carajas and Itabira fine ore by 71.5% for fiscal year 2005 (April 1, 2005, to March 31, 2006). The price per metric ton of Carajas fine ore (66.5% iron) for fiscal year 2005 was $37.36 compared with $21.79 for fiscal year 2004, and for Itabira fine ore, $36.80 compared with $21.46 for fiscal year 2004 (Nippon Steel Corp., 2005b§).

In December 2005, Nippon Steel signed four separate long-term iron ore purchase agreements with four major iron ore suppliers. These included a 10-year iron ore purchase agreement with Hamersley Iron, which was an Australian iron ore company of the Rio Tinto Group, for Nippon Steel to purchase an additional 2 Mt/yr of Yandi fine ore and 2 Mt/yr of high-phosphorus Brockman ore; an agreement to revise the existing (previous) agreement between Robe River Iron Associates and an Australian iron ore joint venture made up of Mitsui & Co. Ltd., Nippon Steel, the Rio Tinto Group, and Sumitomo Metal Industries, Ltd., for the joint venture to take deliveries of 7.5 Mt/yr of Robe ore and 3.5 Mt/yr of West Angelas ore; an agreement with BHP Billiton to revise the long-term agreement for Nippon Steel to purchase 2 Mt/yr of Yandi fine ore and 2 Mt/yr of Newman ore for 7 years beginning in April 2006; and another long-term agreement with CVRD for Nippon Steel to purchase an additional 1 Mt/yr of iron ore for 5 years and 2 Mt/yr of iron ore for 10 years from Itaguai Port beginning in April 2006 (Nippon Steel Corp., 2005a§).

In July 2005, JFE Steel Corp. signed a final agreement with BHP Billiton Ltd. of Australia, Itochu Corp., and Mitsui & Co. to establish a joint venture to mine iron ore at the Yandi Western 4 (W4) Mine in the Pilbara region of Western Australia. Following the establishment of the joint venture in July 2005, an 11-year long-term iron ore purchase contract was expected to go into effect as soon as permission was granted by the Australian Government. Under the terms of the agreement, the joint venture at W4 Mine would be owned by BHP Billiton (68%), JFE Steel (20%), Itochu (6.4%), and Mitsui & Co. (5.6%). Economically exploitable reserves in the W4 mining area were estimated to be 115 Mt, and maximum iron ore production from the W4 was expected to be 15 Mt/yr for an estimated 11 years. Under the terms of the long-term iron ore purchase contract, JFE Steel would purchase 16 Mt/yr of iron ore, which was equivalent to one-third of JFE's annual iron ore requirements, from the W4 Mine for 11 years. BHP Billiton's W4 Mine produced about 40 Mt/yr of iron ore with estimated minable reserves of about 1 billion metric tons (JFE Steel Corp., 2005c§).

In 2005, pig iron production increased by 0.1% to about 83.1 Mt, of which 82.4 Mt was for steelmaking, and 621,300 t, for foundry. The iron manufacturing capacity, however, increased to 83.4 Mt/yr from 82.0 Mt/yr in 2004. The number of furnaces for iron manufacturing increased to 30 from 29. The number of blast furnaces remained unchanged at 28, and other furnaces increased to 2 from 1 in 2004 (Ministry of Economy, Trade and Industry, 2005c, p. 32, 107).

Crude steel production decreased by 0.2% to 112.5 Mt, of which 74.4% was processed by basic oxygen furnaces (LD converters), and 25.6%, by electric furnaces. The steel manufacturing total capacity increased to 124.1 Mt/yr from 120.8 Mt/yr in 2004. The number of furnaces for steel manufacturing decreased to 412 from 415 in 2004. The number of basic oxygen furnaces (LD converters) increased to 63 compared with 62 in 2004, and the manufacturing capacity of the LD converters increased to 84.2 Mt/yr from 81.4 Mt/yr in 2004. The number of electric arc furnaces decreased to 349 from 353 in 2004 and the manufacturing capacity of electric arc furnaces increased to 40 Mt/yr from 39.4 Mt/yr in 2004 (Ministry of Economy, Trade and Industry, 2005c, p. 44, 107).

In 2005, Japan was the world's second ranked producer of crude steel after China and accounted for 9.9% of the world total. Among Japan's top four steelmakers in 2005, Nippon Steel, which produced 32 Mt of crude steel, was the third ranked steel-producing company in the world after Mittal Steel Co. of the Netherlands and Arcelor S.A. of Luxembourg; JFE Steel, which produced 29.9 Mt, ranked fifth; Sumitomo Metal Industries, Ltd., which produced 13.5 Mt, ranked 16th; and Kobe Steel Ltd., which produced 7.7 Mt, ranked 32d (International Iron and Steel Institute, 2006§).

In January 2005, Nippon Steel and Sumitomo Metal Industries began to study the potential joint use of iron- and steelmaking facilities at Sumitomo Metal Industries' Wakayama Works to secure and improve their supply capabilities to meet the growing demand for steel in the domestic and overseas markets. To enhance further cooperation, Kobe Steel reportedly also participated in the study. The three companies had been implementing various cooperative measures, such as mutual cooperation in the purchase of raw materials and machinery, in the management of all nearby steel works, and in the supply of semifinished and downstream products during relining of blast furnaces, as well as joint operations in stainless steel and welding materials and supplied semifinished products (Nippon Steel Corporation, 2005b§, c§).

In June 2005, JFE Steel signed an agreement with ThyssenKrupp Stahl AG of Germany to establish a joint venture to enable vendor involvement with the global automaker. In December 2005, Hyundai HSCO of the Republic of Korea

renewed its comprehensive collaboration agreement with JFE Steel to ensure stable supplies of high-quality automotive steel sheets for the Republic of Korea's automakers (JFE Steel Corp., 2005b§, e§)

In 2005, domestic demand for steel, as measured by domestic orders for ordinary and specialty steel products, increased by only 0.7% to about 67.9 Mt, of which 54.7 Mt was ordinary steel products and 13.2 Mt, specialty steel products. The increase in overall domestic demand for steel in 2005 was mainly the result of a 6.2% increase in demand by the manufacturers of automobiles and a 12.9% increase in demand by the manufacturers of shipbuilding and marine equipment. The increased domestic demand by the manufacturers of automobiles and shipbuilding and marine equipment offset the decreased domestic demand by the manufacturers of electric machinery and equipment, home and office appliances, and tanks and containers (table 6).

Exports of iron and steel decreased by 7.6% to 32.6 Mt in 2005 but the earnings from exports of iron and steel increased by 18.5% to $29.6 billion from $25.3 billion in 2004 because of higher export unit prices. Of the total amount of iron and steel products exported, exports to China accounted for 17.7% compared with 19.5% in 2004; to the Republic of Korea, 23.7% compared with 25.4% in 2004; to Taiwan, 11.1% compared with 9.2%; to Thailand, 12.6% compared with 11.0% in 2004; and to the United States, 4.4% compared with 4.0% in 2004. In terms of export volume, the Republic of Korea remained the leading market for Japan's iron and steel exports. Thailand was the only country to which Japan's exports of iron and steel continuously increased in the past 5 years (table 7). Of the total exports of iron and steel in 2005, 23.04 Mt was ordinary steel products; 4.59 Mt, specialty steel products; 4.07 Mt, steel ingots and semifinished products; 0.60 Mt, secondary products; 33,568 t, pig iron; and 221,978 t, others (ferroalloys, clad plate, and cast-iron pipes) (Japan Iron and Steel Federation, 2006§).

In 2005, imports of iron and steel products increased by 19.7% to 8.4 Mt owing mainly to a 22.5% increase in imports of ordinary steel products; the import bill for iron and steel increased by 8.2% to $7.63 billion from $7.05 billion in 2004. Of the total imports, 4.2 Mt was ordinary steel products; about 3.2 Mt was pig iron, ferroalloys, steel ingot, and semimanufactured steel; 569,886 t was secondary steel wire and other secondary steel products; and 294,100 t was specialty steel products. Of the ordinary steel products imported, imports of hot-rolled wide strip increased by 73.9% to 1.6 Mt and those of cold-rolled sheet and strip, by 54.1% to 1.1 Mt. Imports of specialty steel products decreased by 0.7% to 294,100 t. The major suppliers of ordinary steel products were the Republic of Korea (55.9%), Taiwan (21.1%), and China (19.5%) in 2005 (Japan Iron and Steel Federation, 2006§).

Manganese.—Japan relied on imports to meet all its manganese raw material requirements for the iron and steel and EMD industries. In 2005, Japan imported 1.2 Mt of high-grade manganese ore, 97,721 t of ferruginous manganiferous ore, 28,636 t of low-grade manganese ore, and 1,489 t of high-grade manganese dioxide ore. The major suppliers of high-grade manganese ore were South Africa (64.7%) and Australia (31.9%). The major suppliers of ferruginous manganiferous ore were South Africa (59.3%) and India (39.6%). Ghana supplied 99.9% of Japan's low-grade manganese ore imports, and Gabon supplied 94% of Japan's high-grade manganese dioxide ore imports for the year. The import bill for manganese ores totaled $220.9 million (Ministry of Finance, 2005b, p. 170).

Production of ferromanganese increased by 2.6% to 448,600 t in 2005 (Ministry of Economy, Trade and Industry, 2005c, p. 34). Imports of ferromanganese increased by 20.7% to 61,800 t. The major suppliers were Australia (31.7%), South Africa (31.4%), China (24.0%), India (6.4%), and the Republic of Korea (4.7%). Japanese imports of ferrosilicomanganese decreased by 22.0% to 234,400 t. The principal suppliers were China (57.2%), Ukraine (17.70%), the Republic of Korea (5.5%), Australia (5.3%), and Kazakhstan (4.8%). The imports bill for ferromanganese and ferrosilicomanganese totaled $183.7 million (Ministry of Finance, 2005b, p. 630).

Consumption of high- and low-carbon ferromanganese for steel manufacturing increased by 5.6% to 419,000 t, of which 358,000 t was high-carbon ferromanganese and 61,000 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2005c, p. 216). In 2005, consumption of ferrosilicomanganese increased by 3.2% to 305,000 t and exports of ferromanganese decreased by 2.5% to 9,600 t. The major buyers were the United States (34.2%), Taiwan (26.4%), Malaysia (14.5%), and Thailand (11.6%). Export earnings from ferromanganese totaled $13.1 million (Ministry of Finance, 2005a, p. 501).

In 2005, Japan was the world's second ranked producer of EMD after China. Japan's EMD producers were Mitsui Mining & Smelting, which operated the Takehara plant (24,000 t/yr) in Hiroshima Prefecture, and Tosoh Corp., which operated the Hyuga plant (34,000 t/yr) in Miyazaki Prefecture and the Thessaloniki (Salonita) plant (19,000 t/yr) in Greece. Japan Metals & Chemical Co. Ltd., which operated the Takaoka plant (18,000 t/yr) in Toyama Prefecture, stopped EMD production in 2002. In 2005, Japan produced about 45,500 t of EMD, about 17,000 t of which was consumed domestically for the production of batteries. Imports of EMD increased by 92% to 13,400 t and were valued at $16.3 million. South Africa, Australia, and China were the three principal suppliers and accounted for 36.8%, 31.8%, and 27.1% of Japanese EMD imports, respectively. Exports of EMD totaled 29,086 t and were valued at $36.9 million. The major buyers were Indonesia (33.1%), Singapore (23.8%), the United States (17.0%), China (9.0%), and the Republic of Korea (7.1%) (Ministry of Finance, 2005a, p. 114-115; 2005b, p. 182; Arumu Publishing Co. Ltd., 2006, p. 44-45).

Nickel.—Japan was the world's leading importer and consumer of nickel, but relied on imports to meet all its nickel raw material requirements in 2005. It was the world's second ranked producer of nickel metal after Russia (World Bureau of Metal Statistics, 2006, p. 104). Nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide and powder, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel were imported to meet the nickel requirements of the battery, catalysts, magnetic materials, nonferrous alloys, plating, and specialty steel industries, and other end users.

In 2005, imports of nickel ore increased by 5.5% to 4.75 Mt and were valued at $345.1 million. The suppliers of nickel ore were Indonesia (46.6%), the Philippines (29.0%), and New Caledonia (24.4%). Imported nickel ore from Indonesia contained 35,500 t of nickel; the Philippines, 23,200 t of nickel; and New Caledonia, 21,700 t of nickel. Imports of nickel mattes, in gross weight, decreased by 16.4% to 106,400 t and were valued at $983.7 million. The suppliers of nickel matte were Indonesia (88.6%) and Australia (11.4%). Imported nickel mattes from Indonesia contained 70,700 t of nickel, and Australia, 9,100 t (Ministry of Finance, 2005a, p. 170, 671; Japan Mining Industry Association, 2006, p. 108).

Imports of ferronickel, in gross weight, decreased by 13.2% to 48,200 t and were valued at $204.2 million. The suppliers of ferronickel were New Caledonia (66.4%), Colombia (17.6%), the Dominican Republic (10.8%), and Indonesia (4.8%). Imported ferronickel from New Caledonia contained 8,970 t of nickel; Colombia, 3,400 t of nickel; the Dominican Republic, 2,030 t; and Indonesia, 460 t. Imports of refined nickel decreased by 4.3% to 49,700 t and were valued at $751.5 million. The major suppliers of refined nickel were Norway (15.2%), Russia (14.4%), South Africa (14.2%), China (13.6%), Brazil (12.3%), Zimbabwe (8.9%), Australia (7.9%), Canada (6.3%), and the United Kingdom (4.7%). Imports of nickel oxide sinter, in gross weight, decreased by 39.0% to 763 t and were valued at $9.2 million; Australia and Cuba were the two dominant suppliers of nickel oxide and accounted for 66.5% and 30.2%, respectively. Imports of nickel powders and flakes decreased by 53.4% to 4,380 t and were valued at $69.0 million. The major suppliers of nickel powders and flakes were Canada (85.3%), Russia (6.5%), and the United Kingdom (6.4%). Imports of nickel waste and scrap decreased by 25.0% to 7,050 t and were valued at $77.1 million. The major suppliers of nickel waste and scrap were the United States (25.9%), Russia (18.8%), the Republic of Korea (17.4%), and Taiwan (9.1%) (Ministry of Finance, 2005b, p. 630, 671).

To secure processed nickel products overseas to extend their nickel processing businesses in Japan, SMM and SC participated in major nickel development projects in New Caledonia and Madagascar in 2005. In August 2005, SC agreed to join Dynatec Corp. (75%) of Canada in the Ambatovy nickel laterite development project, which is located about 80 km east of Antananarivo—the capital city of Madagascar—by taking a 25% interest in the project. Under the agreement, SC would provide 25% of the equity portion of the project's capital cost and a proportional share of the project's debt guarantees. SC also would provide Dynatec with a subordinated loan to help fund Dynatec's equity contribution to the capital cost. SC had committed to find a market for at least 30,000 t/yr of nickel during the first 15 years of production. According to Dyantec's 2005 feasibility study of Ambatovy, the nickel mine could produce 60,000 t/yr of nickel and 5,600 t/yr of cobalt. The average cash operating costs for the first 10 years were estimated to be $0.67 per pound of nickel. The capital costs were estimated to be $2.25 billion. The mine construction was expected to begin in June 2006, and the production of nickel was scheduled to begin in 2008 (Mining Journal, 2005c).

SMM and Mitsui & Co. Ltd., through Sumic Nickel Netherlands, which was a joint venture of SMM (52.38%) and Mitsui & Co. (47.62%), signed an agreement with Inco Ltd. of Canada to acquire a 21% equity interest in Goro Nickel S.A. for $150 million in April 2005. Inco's Goro nickel-cobalt project, which is located in New Caledonia, is owned by Inco (69%); Sumic Nickel Netherlands (21%); and three provinces of New Caledonia (10%). The Goro nickel-cobalt project, which will use hydrometallurgical process technology, was scheduled to produce about 60,000 t/yr of nickel in nickel oxide and between 4,000 and 5,000 t/yr of cobalt in cobalt carbonate by mining and treating about 4 Mt/yr of ore starting in the fall of 2007. Under the agreement, Sumic Nickel Netherlands was obligated to provide its share of the financing required to complete the project and to buy its share of the nickel and cobalt produced from Goro (Mining Journal, 2005a; Mining News, The, 2005§; Sumitomo Metal Mining Co. Ltd., 2005a§).

In August 2005, SMM reportedly had shown interest in pursuing exploration of nickel and cobalt on Santa Isabel in the Solomon Islands. According to the Ministry of Mines and Energy of Solomon Islands, the Department of Mines had issued SMM a Letter of Intent before issuing a prospecting license (Metals Place, 2005a§).

In 2005, production of ferronickel, in gross weight, increased by 4.5% to about 391,100 t; the ferronickel contained about 76,400 t of nickel. Ferronickel producers were Pacific Metals Co. Ltd. in Hachinohe, Aomori Prefecture, which produced 41,621 t of nickel; SMM in Hyuga, Miyazaki Prefecture, 22,638 t of nickel; and YAKIN Oheyama Co. Ltd. at Oheyama near Miyazu, Kyoto Prefecture, 12,131 t of nickel (Arumu Publishing Co. Ltd., 2006, p. 80).

Consumption of ferronickel for steel manufacturing, in gross weight, decreased by 10.4% to 281,300 t in 2005 (Ministry of Economy, Trade and Industry, 2005c, p. 216). Exports of ferronickel increased by 13.2% to 125,600 t and were valued at $321.6 million, 48.4% of which went to the Republic of Korea; 41.9%, to Taiwan; and 9.7%, to China (Ministry of Finance, 2005a, p. 501).

Refined nickel was produced solely by SMM at its nickel refinery in Niihama, Ehime Prefecture. The 36,000-t/yr refinery used its own matte chlorine leaching electrowinning (MCLE) technology to process imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and export. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce briquettes, granules, and nickel oxide sinters for domestic consumption and export.

In April 2005, SMM began commercial operation of a processing plant at Rio Tuba in the southern part of Palawan Island in the Philippines (Coral Bay Nickel Project) to produce nickel-cobalt-mixed sulfide from low-grade nickel oxide lateritic ore. According to SMM, the high-pressure acid leach (HPAL) method of processing low-grade nickel oxide ore was implemented successfully at the Coral Bay project after construction of the plant was completed in August 2004. The project called for the plant to process the 16 Mt of nickel oxide ores and low-grade laterite (limonite), which were mined and stockpiled at the Rio Tuba mine site, by using HPAL to produce

about 10,000 t of nickel and 700 t of cobalt in nickel/cobalt mixed sulfide that was to be delivered to SMM's Niihama Nickel Refinery for the production of electrolytic nickel and electrolytic cobalt using its own MCLE process technology. The Coral Bay Nickel Project was owned by SMM (54%), Mitsui & Co. and Sojitz Corporation (18% each), and Rio Tuba Nickel Mining Corporation (10%) (Sumitomo Metal Mining Co. Ltd., 2005a§, b§).

In 2005, the domestic demand for refined nickel decreased by 15.3% to 58,000 t owing mainly to the sharp decline in demand by the manufacturers of specialty steel, batteries, and magnetic steel and catalysts. The domestic demand for refined nickel by the manufacturers of specialty steel decreased by 16.6% to 46,200 t; batteries, by 31.4% to 3,100 t; magnetic steel, by 17.0% to 1,900 t; and catalysts, by 9.5% to 440 t. Demand for refined nickel by the manufacturers of galvanizing sheet increased by 13.7% to 3,280 t, and by other end users, by 5.2% to 3,200 t (Ministry of Economy, Trade and Industry, 2005c, p. 280).

In 2005, exports of refined nickel increased sharply by 650.2% to 1,673 t from 223 t in 2004. Export earnings from refined nickel were valued at $22.9 million compared with $3.7 million in 2004. The major buyers of refined nickel were China (64.8%), Hong Kong (27.5%), Indonesia (3.4%), and Thailand (2.6%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 5.6% to 34,550 t and were valued at $435.5 million. The principal buyers were the Republic of Korea (52.4%) and Taiwan (45.6%). Exports of nickel powders and flakes increased by 8.4% to 1,810 t and were valued at $48.1 million. The major buyers were China (58.2%), Hong Kong (18.5%), the Republic of Korea (7.1%), and the United States (5.7%). Exports of nickel waste and scrap increased by 181.2% to 1,125 t and were valued at $9.8 million. The major buyers were the United Kingdom (46.3%), the United States (28.4%), and Vietnam (9.3%) (Ministry of Finance, 2005a, p. 582-583).

Titanium.—In 2005, Japan replaced Russia as the world's first ranked producer of titanium sponge metal and accounted for 30.2% of the world total (Arumu Publishing Co. Ltd., 2006, p. 67). Japan also was one of the world's major producers of titanium dioxide pigment. Japan imported its raw material requirements for the production of titanium sponge metal and titanium dioxide pigment mainly from Australia, India, and Vietnam. Titanium ore (rutile) was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed by the manufacturers of synthetic rutile and titanium dioxide pigment.

In 2005, imports of titanium ore (rutile) increased by 41.0% to 126,930 t and were valued at $64.8 million. The major suppliers were Australia (51.8%), India (33.9%), Canada (7.3%), and South Africa (6.4%). Imports of ilmenite increased by 6.3% to 382,900 t and were valued at $43.9 million. The major suppliers were Vietnam (40.8%), Australia (21.5%), Egypt (14.2%), Canada (11.6%), India (6.0%), and Malaysia (5.8%) (Ministry of Finance, 2005b, p. 171).

According to the estimate by Advanced Materials Japan Corporation, production of titanium sponge increased by 31.9% to 31,000 t because of the stronger demand in the domestic and overseas markets, especially the U.S. market. According to the statistics published by the Japan Titanium Society and the Ministry of Finance, total titanium sponge shipments increased by 16.5% to 30,550 t in 2005; shipments of titanium sponge to the domestic market increased by 18.5% to 21,350 t; exports of titanium sponge increased by 12.0% to 9,200 t; and imports of titanium metal powder decreased by 34.5% to 3,930 t. Exports of titanium sponge went mainly to the United States (67.9%) and the United Kingdom (23.1%). Imports of titanium metal powder were mainly from Kazakhstan (37.0%), Russia (29.0%), and the United States (18.5%). Shipments of titanium mill products increased by 25.6% to 17,400 t; domestic shipments of titanium mill products increased by 17.6% to 10,100 t, and exports of titanium mill products decreased by 5.5% to 8,100 t (Arumu Publishing Co. Ltd., 2006, p. 66-70).

To meet the rising worldwide demand for titanium sponge metal, Toho Titanium Co. Ltd. raised its sponge production capacity to 15,000 t/yr in October 2005 from 13,000 t/yr. Toho planned to expand its capacity to 15,700 t/yr in August 2007 and, ultimately, to 22,000 t/yr in 2011. In February, Sumitomo Titanium Corp. announced that it planned to raise its sponge production capacity to 24,000 t/yr from 18,000 t/yr in two stages at a total cost of about $57 million. The capacity would be raised to 22,000 t/yr in September 2005 during the first stage of expansion at a cost of $43 million and, in the second stage, to 24,000 t/yr in March 2006 at a cost of $14 million (Arumu Publishing Co. Ltd., 2006, p. 66).

Production of titanium dioxide increased by 2.2% to 259,000 t in 2005 owing mainly to a stronger domestic demand by the manufacturers of paints and coating material, printing inks and pigments, and synthetic resin (plastics). Shipments of titanium dioxide totaled about 251,600 t, of which domestic shipments were 168,300 t, and exports, 83,340 t. Japan's domestic shipments of titanium dioxide by end-use were paints and coating materials (45.5%), printing inks and pigments (21.8%), synthetic resin (plastics) (10.9%), paper (8.6%), chemical fibers (1.4%), rubbers (1.3%), condensers (0.9%), and others (9.7%) (Ministry of Economy, Trade and Industry, 2005b, p. 57; Roskill's Letters from Japan, 2006b).

Imports of titanium oxide decreased by 13.9% to 13,100 t and were valued at $19.7 million. The major suppliers were China (49.2%), the Republic of Korea (33.0%), France (5.2%), Germany (4.1%), and Malaysia (3.8%) in 2005 (Ministry of Finance, 2005b, p. 183). Exports of titanium oxide decreased by 15.4% to 26,300 t and were valued at $77.5 million. The major buyers were China (36.0%), Taiwan (27.4%), the Republic of Korea (8.5%), Indonesia (5.8%), the United States (4.1%), and Thailand (3.8%) (Ministry of Finance, 2005a, p. 115).

Industrial Minerals

Cement.—In 2005, Japan was the world's fourth ranked cement producer and consumer after China, India, and the United States. As of October 2005, the cement industry comprised 18 companies, 32 cement plants, and 58 kilns concentrated in the areas of Chugoku and Kyushu, where most of Japan's limestone resources and limestone quarries are located (Japan Cement Association, 2006§). The cement

industry's total clinker capacity remained unchanged from that of 2004 at 76 Mt/yr; the total number of regular employees, however, declined to 3,313 from 3,349 in 2004. Production of cement clinker increased to 66.7 Mt from 65.4 Mt in 2004 and production of cement increased to 69.6 Mt from 67.4 Mt in 2004. Of the total cement produced in 2005, portland cement accounted for 76.5%; portland blast-furnace cement, 22.3%; and fly ash cement and other cement, 1.2%. The cement industry consumed 76.1 Mt of limestone, 10.2 Mt of clay, 5.6 Mt of silica stone, 5.3 Mt of blast furnace ore slag, and 2.6 Mt of gypsum. Total shipments of cement increased by 2.9% to 68.8 Mt (Ministry of Economy, Trade and Industry, 2005a, p. 70-73, 123, 127, 130).

According to Japan Cement Association, Japan's apparent cement consumption increased by 1.8% to 59.0 Mt and its apparent cement consumption per capita increased to 462 kg from 454 kg in 2004. Japan's per capita cement consumption, which peaked at 697 kg in 1991 and then started its downward trend to a low point of 454 kg in 2004, rebounded to 462 kg in 2005 (Japan Cement Association, 2006§). Exports of cement clinker decreased by 18.0% to 4.05 Mt and were valued at $91.6 million; those of portland cement increased by 14.1% to 6.09 Mt and were valued at $143.5 million. The major buyers of cement clinker were Hong Kong (25.0%), Australia (18.0%), Malaysia (10.0%), Benin (9.0%), China (7.1%), and Brunei (5.6%). The major buyers of portland cement were the Republic of Korea (24.7%), Singapore (19.8%), China (13.6%), Hong Kong (12.2%), Nigeria (12.0%), Kuwait (6.1%), Taiwan (5.2%), and the United Arab Emirates (2.8%). The average export f.o.b. price of portland cement increased to $23.56 per metric ton from $21.77 per metric ton in 2004 (Ministry of Finance, 2005a, p. 102). In 2005, Japan imported only 1,362 t of cement clinker mainly from China (88.1%) and France (11.7%). Imports of portland cement increased by 11.9% to 912,800 t. The Republic of Korea was the dominant supplier and accounted for 94.9%. The average import c.i.f. price of portland cement increased to $39.52 per metric ton in 2005 from $39.01 per metric ton in 2004 (Ministry of Finance, 2005b, p. 169).

Limestone.—Japan was one of the world's leading limestone producers. In 2005, limestone production increased by 2.1% to 165.2 Mt. Domestic demand increased by 2.0% to 156.6 Mt. The stronger demand for limestone in the domestic market was boosted by increased demand for the production of cement, ferroalloys, and steel in the manufacturing sector and for concrete aggregate in the construction sector. Domestic limestone demand by end use was cement (41.7%), concrete aggregate and refractory materials (22.2%, each), ferroalloys and steel smelting (15.3%), roads (4.9%), and refractories, soda, glass and other uses (15.9%) (Ministry of Economy, Trade and Industry, 2005d, p. 140-141).

Japan was a net exporter of limestone in 2005. To meet certain domestic limestone requirements, however, Japan's imports of limestone flux, limestone, and other calcareous stone totaled 293,900 t and were valued at $12.2 million. The major suppliers were Vietnam (45.9%), Malaysia (33.3%), China (12.9%), and the Philippines (7.1%). Exports of limestone flux, limestone, and other calcareous stone totaled 3.32 Mt and were valued at $25.3 million. The major buyers were Taiwan (55.5%), the Republic of Korea (25.6%), and Australia (16.8%) (Ministry of Finance, 2005a, p. 101; b, p. 169).

Mineral Fuels

Coal.—Japan relied on imports to meet all its annual requirements for coking coal and anthracite mainly for the iron and steel industry, and to meet about 99% of its annual requirements for steam (thermal) coal mainly for the cement, chemical, electric power, and paper and pulp industries. Japan produced a small quantity of steam coal from about eight coal mines, all of which were located in Hokkaido Prefecture for consumption by the local power generation plants.

In 2005, coal was produced mainly by an underground mine operated by Kushiro Coal Mine Co. Ltd., and seven small-scale open pit mines in Hokkaido Prefecture. The Kushiro Mine, which was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia, produced about 700,000 t, and the remaining seven small-scale coal mining companies produced a total of about 450,000 t (Japan Coal Energy Center, 2005).

In 2005, Japan's overall coal imports increased by only 0.5% to 180.8 Mt, which was valued at $13.73 billion; of the total imports, 96.17 Mt was bituminous coal (steam other than coking coal), which was valued at $5.95 billion; 78.75 Mt was coking coal, which was valued at $7.25 billion; and 5.9 Mt was anthracite, which was valued at $528 million. The major suppliers of coking coal were Australia (55.5%), Indonesia (21.10%), Canada (8.4%), China (7.2%), Russia (4.2%), and the United States (2.6%); the major suppliers of bituminous coal (steam coal) were Australia (62.0%), China (17.0%), Indonesia (13.2%), and Russia (6.9%); and the major suppliers of anthracite were Vietnam (39.9%), China (33.4%), Russia (13.9%), Australia (7.4%), and North Korea (4.7%) (Ministry of Finance, 2005b, p. 172).

To secure a long-term stable supply of coking coal, JFE Shoji Trade Corp. and JFE Steel announced in June 2005 that they had each acquired a 2.5% interest in two coking coal mines in Australia owned by American Metals & Coal International, Inc. According to JFE Steel, the two coking coal mines were Caborough Downs Coal Mine, which is an underground coal mine that is located in the State of Queensland, and Glennies Creek Coal Mine, which is an underground coal mine that is located in the State of New South Wales. Caborough Downs and Glennies Creek each would supply a total of 6 Mt to JFE Steel and JFE Shoji Trade during a 10-year period beginning in 2006. In October 2005, JFE Steel announced that it had reached a basic agreement with Elk Valley Coal Corp. of Canada for a long-term coking coal purchase contract. Under the contract, JFE Steel would purchase 2.5 Mt/yr of hard coking coal for a 10-year period beginning in 2006 (JFE Steel Corp., 2005a§, d§).

Natural Gas and Petroleum.—Japan was one of the world's leading consumers and importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was insignificant because of the country's limited indigenous oil and gas reserves. Japan's natural gas and crude petroleum reserves were estimated to be 39.6 billion cubic

meters and 58.5 million barrels (Mbbl), respectively (Oil & Gas Journal, 2005).

In June 2005, Japan Petroleum Exploration Company (Japex) announced that it had discovered natural gas and oil in a field that is located about 4 km offshore near the town of Nakajo in Niigata Prefecture. According to Japex Offshore Ltd., which was a subsidiary of Japex, the joint appraisal drilling with Mitsubishi Gas Chemical Company produced about 60,000 cubic meters of natural gas and 200 barrels per day (bbl/d) of oil. The field reportedly was 80% owned by Japex and 20% owned by Mitsubishi Gas (Rigzone.com, 2005§).

In 2005, domestic production of natural gas increased by 8.2% to 3.12 billion cubic meters, of which about 98.8% was produced from gasfields mainly in the Prefectures of Niigata (64.4%) and Hokkaido (12.8%); and 1.2%, from oilfields mainly in Akita Prefecture. Crude petroleum production increased by 10.0% to 5.77 Mbbl. Japan relied on imports to meet all its annual natural gas and crude oil requirements for its power generating and oil refining industries. In 2005, Japan imported 76.2 billion cubic meters (50.91 Mt) of natural gas in the form of LNG. However, according to the Ministry of Finance's Trade statistics, imports of LNG totaled 58.01 Mt (86.84 billion cubic meters) and were valued at $18.02 billion. The major suppliers of LNG were Indonesia (24.6%), Malaysia (23.4%), Australia (17.5%), Qatar (10.9%), Brunei (10.8%), the United Arab Emirates (8.8%), and the United States (2.2%) (Ministry of Economy, Trade and Industry, 2005d, p. 22-23, 26-28, 106-107; Ministry of Finance, 2005b, p. 178).

Crude petroleum imports of 1.54 billion barrels (Gbbl) were mainly from the Middle East (90.2%) and Southeast Asia (4.5%). The major suppliers of crude petroleum were Saudi Arabia (29.0%), the United Arab Emirates (24.5%), Iran (13.8%), Qatar (9.6%), Kuwait (7.5%), Indonesia and Oman (2.9% each), and the Neutral Zone (of Kuwait and Saudi Arabia) (1.9%). Imports of crude petroleum were valued at $79.9 billion (Ministry of Economy, Trade and Industry, 2005d, p. 28-34; Ministry of Finance, 2005b, p. 173).

Japan's petroleum industry comprised 19 companies with a total of about 20,000 employees. The petroleum refining industry consisted of 29 operating refineries that were owned and operated by 16 oil refining companies that had a total combined refining capacity of 4.77 million barrels per day. The crude petroleum processing capacity utilization rate was 87.2% in 2005 compared with 84.4% in 2004 (Petroleum Association of Japan, 2006§, p. 9, 61).

In 2005, demand for crude petroleum (crude petroleum processed by the domestic refineries) increased by 2% to 1.51 Gbbl, of which 99.7% was imported crude petroleum. Domestic demand for refined petroleum, by product, was as follows: gasoline, 387.6 Mbbl; heavy fuel oil, 347.4 Mbbl; naphtha, 311.6 Mbbl; diesel (gas oil), 235.5 Mbbl; kerosene, 185.8 Mbbl; jet fuel, 30.9 Mbbl; asphalt, 20.9 Mbbl; lubricants, 12.9 Mbbl; and paraffin wax, 481,000 bbl. To meet its domestic demand, Japan imported 231 Mbbl of refined fuel products, which included 179.7 Mbbl of naphtha; 24.3 Mbbl of heavy fuel oil; 15.4 Mbbl of gasoline; 6.2 Mbbl of kerosene; 3.0 Mbbl of diesel; and 2.2 Mbbl of jet fuel. Other imported refined petroleum products included 155.6 Mbbl of liquefied petroleum gas, 359,600 bbl of lubricants, and 51,700 bbl of paraffin wax (Ministry of Economy, Trade and Industry, 2005d, p. 76, 86-89).

Consumption of domestically produced natural gas increased by 7.3% to 3.8 billion cubic meters, of which the gas industry (distribution for household uses) accounted for 52.1%; electric power generation, 15.2%; oil and gas industry use, 14.9%; chemicals, 12.3%; and other manufacturing and services uses, 5.6%. Of the 50.96 Mt (76.28 billion cubic meters) of imported LNG, about 70% was consumed by the electric power industry for power generation and about 30% was for household gas and industrial use (Ministry of Economy, Trade and Industry, 2005d, p. 24, 83).

At the end of 2005, Japan's stockpile of crude petroleum and partially refined and refined petroleum products amounted to a 170-day supply. This total included 91 days in the national (Government-owned) stockpile and 79 days in the private (privately owned) stockpile (Ministry of Economy, Trade and Industry, 2005d, p. 150-151).

Reserves

Japan's reserves of limestone and other industrial minerals, such as dolomite, iodine, pyrophyllite, and silica stone, are large. Coal reserves are not large and are very costly to mine. With the exception of gold, ore reserves for metallic minerals and other minerals, especially oil and gas, are negligible (table 3).

Infrastructure

Japan had one of the most modern infrastructures for its mining and mineral-processing industries in the world. Despite its small land area, Japan had a highway system of 1.18 million kilometers, of which 925,000 km was paved and 258,000 km was unpaved. The railroad network had 23,600 km, of which 16,600 was electrified. Highway and railroad networks link all major seaports and all coastal cities on the four major islands. The networks also connect Honshu to Kyushu and Shikoku Islands in the south and Hokkaido Island in the north by means of bridges and tunnels.

Japan's domestic and international telecommunication services were among the best in the world; they included land and mobile phone services; satellite earth stations [five Intelsat (four in the Pacific Ocean and one in the Indian Ocean), one Intersputnik (in the Indian Ocean), and one Inmarsat (in the Indian and the Pacific Ocean regions)]; submarine cables to China, the Philippines, Russia, and the United States (via Guam); and about 73 Internet service providers and about 12,962,000 Internet hosts. For electric power generation, Japan had 4,683 powerplants with a total capacity of about 266.1 million kilowatts. For electric power transmission, Japan had a route length of about 94,000 km and a circuit length of about 166,000 km. For power distribution, Japan's total length of line distances, which included high- and low-voltage, was about 1,255,000 km concentrated in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. Japan also had an extensive pipeline system that comprised 2,719 km for natural gas, about 170 km for oil, and about 60 km for oil, gas, and water.

Japan had 27 major ports to receive raw materials from overseas and to export manufactured products. The major port facilities, which included terminals and warehouses, were among the most indispensable parts of the infrastructure for the mineral industry because of their roles in receiving imported raw materials (such as coal, crude petroleum, iron ore, LNG, nonferrous ore, and phosphate rock for mineral-processing plants and powerplants) and exporting value-added mineral and metal products. The important seaports of the major mineral-processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Harima, Himeji, Hiroshima, Kawasaki, Kobe, Mizushima, Nagoya, Osaka, Sakai, Shimizu, Tokyo, and Yokohama on Honshu (Main Island); Fukuoka, Kita Kyushu, Moji, and Oita on Kyushu Island; Hakodate, Kushiro, Muroran, and Tomakomai on Hokkaido; and Sakaide on Shikoku Island.

Japan had 175 airports (145 had paved runways and 30, unpaved) in 2005. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita (New Tokyo), and Osaka. Japan's round-the-clock airport, Kansai International, sits on reclaimed offshore land in Osaka Bay.

Outlook

Japan's economy is forecasted to continue to grow at a rate 2.7% in 2006 and then to grow at a slower pace of 2.1% in 2007 (International Monetary Fund, 2006§). Domestic mining activities during the next 2 years are expected to decline in the industrial minerals sector as in the production of lead, silver, and zinc mainly because of the depleting ore reserves. Metal production of copper and zinc is expected to hold steady or to increase slightly in 2006. During the next 2 years, production of crude steel is expected to exceed 113 Mt because of the continued strong demand from the Japanese automobile and machinery and equipment sectors and because of an anticipated increase in exports to such Asian countries as Taiwan and Thailand. Production of titanium sponge metal is expected to increase considerably because of the continuing strong domestic demand and increasing orders coming from the United States. Production of cement and limestone is expected to hold steady with no further cutback in public works spending.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue to export more ferrous and nonferrous metals and cement clinker and cement to China, the Republic of Korea, Southeast Asian countries, and Taiwan where the economies are expected to continue to improve in the coming years. Imports of coal, iron ore, nonferrous metals, and other minerals are expected to increase during the next 2 years as the consumption of raw materials trend upward in the iron and steel, nonferrous metals, and utility industries.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, which will ensure a steady economic growth, Japan is expected to continue its active search for direct investment in joint exploration and development of minerals in developed and developing countries, especially in Australia, Canada, Chile, China, Indonesia, Mexico, Peru, the Philippines, and the United States. The targeted minerals were antimony, chromium, coal, columbium (niobium), copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

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Ministry of Economy, Trade and Industry
Economic and Industrial Policy Bureau
Research and Statistics Department
1-3-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8902, Japan
Telephone: 81-3-3501-1511, ext. 2868

Japan Oil, Gas and Metals National Corp.
Kawasaki Head Office, 1310 Omiya-cho,
Saiwai-ku, Kawasaki-city
Kanagawa 212-8554, Japan
Telephone: 81-44-520-8600
Fax: 81-44-520-8710
Internet: http://www.jopmec.go.jp
National Institute of Advanced Industrial Science and Technology
Geological Survey of Japan
AIST Tsukuba Central 7, Tsukuba
Ibaraki 305-8567, Japan
Telephone: 81-298-54-3513
Fax: 81-298-54-3533

Major Publications

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The Steel Industry of Japan, Japan Iron and Steel Federation, annual.

TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS						
Aluminum:						
Alumina	thousand metric tons	331	333	363	380 [r]	350 [e]
Aluminum hydroxide	do.	739	724	740	750 [r]	740 [e]
Metal:						
Primary:						
Regular grades	do.	7	6	6	6	7
High-purity	do.	27	40	44	55	45
Secondary[2]	do.	1,171	1,239	1,261	1,015	1,035
Antimony:						
Oxide		8,789	9,052	8,235 [r]	8,716	7,792
Metal		101	183	121	222	253
Arsenic, trioxide[e]		40 [r]	40 [r]	40 [r]	40 [r]	40
Bismuth		551	474	513	522	463
Cadmium, refined		2,460	2,444	2,509	2,233	2,297
Chromium, metal[e]		1,350	1,600	1,500	1,600	700
Cobalt, metal		350	354	379	421 [r]	471
Copper:						
Mine output, Cu content		744	--	--	--	--
Metal:						
Blister and anode:						
Primary		1,328,489	1,317,291	1,343,353	1,270,995	1,319,247
Secondary		139,764	182,069	172,724	194,927	198,516
Total		1,468,253	1,499,360	1,516,077	1,465,922	1,517,763
Refined:						
Primary		1,287,165	1,211,111	1,251,728	1,188,491	1,227,528
Secondary		138,526	189,968	178,637	191,653	167,756
Total		1,425,691	1,401,079	1,430,365	1,380,144	1,395,284
Gallium, metal:						
Primary[e]		8	8	9	9	9
Secondary		62	80	83	81	81
Germanium:						
Oxide[e]		10	20	30	50	50
Metal, polycrystal	kilograms	1,615	803	621	943	1,731
Gold:						
Mine output, Au content	do.	7,815	8,615	8,143	8,021	8,318
Metal:						
Primary	do.	155,826	144,748	161,399	136,616	146,182
Secondary[3]	do.	19,831	21,160	22,549	23,183	23,710
Total	do.	175,657	165,908	183,948	159,799	169,892
Indium, metal[e]	do.	55,000	60,000	70,000	70,000	70,000
Iron and steel:						
Iron ore and iron sand concentrate:[e]						
Gross weight		750 [4]	--	--	--	--
Fe content		258 [4]	--	--	--	--
Metal:						
Pig iron	thousand metric tons	78,836	80,979	82,091	82,974	83,058

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS--Continued						
Iron and steel--Continued:						
Metal--Continued:						
Electric-furnace ferroalloys:						
Ferrochrome		111,167	91,937	19,427	13,472	12,367
Ferromanganese		368,293	356,717	371,831	437,389	448,616
Ferronickel		367,739	370,973	369,099	374,213	391,074
Silicomanganese		62,238	70,965	58,043	73,041	94,725
Other:						
Ferromolybdenum		3,485	2,375	2,691	3,323	4,019
Ferrotungsten		109	9	12	--	--
Ferrovanadium		3,613	3,592	3,491	2,178	2,360
Unspecified		5,733	6,376	3,813	7,321	10,057
Total		922,377	902,944	828,407	910,937	963,218
Steel, crude	thousand metric tons	102,866	107,745	110,511	112,718	112,471
Semimanufactures, hot-rolled:						
Ordinary steels	do.	78,927	80,838	81,769	83,354	80,828
Special steels	do.	15,835	17,451	18,735	19,843	20,360
Lead:						
Mine output, Pb content		4,997	5,723	5,660	5,512	3,437
Metal, refined:						
Primary		127,358	107,744	105,460	94,272	106,638
Secondary		175,088	178,016	189,831	188,603 [r]	167,480
Total		302,446	285,760	295,291	282,875 [r]	274,118
Magnesium, metal, secondary[e]		10,000	9,000	10,000	10,000	11,000
Manganese, oxide		51,095	45,867	49,115	45,680	45,500 [e]
Molybdenum, metal		610	465	561	812	901
Nickel metal:						
Refined		32,526	32,297 [r]	34,942 [r]	32,677 [r]	29,399
Ni content of nickel oxide sinter		49,600	48,950	52,700 [r]	60,300 [r]	56,700
Ni content of ferronickel		68,113	74,418	74,804 [r]	73,655 [r]	76,390
Ni content of chemical		2,394	1,820	2,084	2,082	2,208
Total		152,633	157,485 [r]	164,530 [r]	168,714 [r]	164,697
Platinum-group metals:[e]						
Palladium, metal	kilograms	4,805 [4]	5,618 [4]	5,500	5,300	5,400
Platinum, metal	do.	791 [4]	762 [4]	770	750	760
Rare-earth oxides[5]		5,109	5,423	5,521	6,015	6,432
Selenium, metal		735	752	734	599	625
Silicon, multicrystalline		4,334	4,453	5,045	6,135	6,923
Silver:						
Mine output, Ag content	kilograms	80,397	81,416	78,862	75,689	54,098
Metal:						
Primary	do.	2,293,028	2,259,551	2,453,204	2,208,270	2,202,795
Secondary[3]	do.	303,804	291,955	258,754	219,047	192,177
Total	do.	2,596,832	2,551,506	2,711,958	2,427,317	2,394,972
Tantalum, metal[e]		90	90	95	95	95
Tellurium, metal		39	29	33	33	23
Tin, metal, smelter		668	659	662	707	754
Titanium:						
Dioxide		256,961	240,469	253,453	253,364	259,015
Metal		24,906	25,199	18,923	23,110 [r]	31,000 [e]
Tungsten, metal		3,607	3,302	3,333	4,166	4,056
Vanadium, metal[e, 6]		890	1,000	1,000	1,000	1,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
METALS--Continued						
Zinc:						
Mine output, Zn content		44,519	42,851	44,574	47,781	41,452
Oxide		75,414	74,515	75,090	75,813	74,843
Metal:						
Primary		541,277	547,183	532,704	534,830	536,768
Secondary		142,777	126,723	153,411	132,417	138,453
Total		684,054	673,906	686,115	667,247	675,221
Zirconium, oxide		7,930	8,650	8,800	9,800	9,700 e
INDUSTRIAL MINERALS						
Bromine[e]		15,000	20,000	20,000	20,000	20,000
Cement, hydraulic	thousand metric tons	76,550	71,828	68,766	67,376	69,629
Clays:						
Bentonite		415,102	437,772	425,945	455,282	421,629
Fire clay, crude[e]		475,665 [4]	480,000	460,000	470,000	460,000
Kaolin		17,240	11,756	12,409	11,553	10,500
Diatomite		129,267 r	123,827 r	111,690 r	126,225 r	130,005
Feldspar and related materials[e]		1,035,000 r	1,334,000 r	1,140,000 r	1,006,000 r	1,000,000
Gypsum	thousand metric tons	5,874	5,644	5,764	5,865	5,913
Iodine		6,643	6,548	6,524	7,264	8,095
Lime, quicklime	thousand metric tons	7,586	7,420	7,953	8,507	8,879
Nitrogen, N content of ammonia	do.	1,318	1,192	1,061	1,101	1,083
Perlite[e]		255,000	250,000	250,000	240,000 r	240,000
Salt, all types[7]	thousand metric tons	1,358	1,282	1,263	1,225	1,227
Silica:						
Sand	do.	5,768	4,893	4,699	4,705	4,700 e
Stone, quartzite	do.	14,213	13,568	12,838	12,218	11,900 e
Sodium compounds, n.e.s.:						
Soda ash[e]		461,204 [4]	410,000	400,000	400,000	400,000
Sulfate, anhydrous		146,780	137,713	132,807	130,107	138,000
Stone, crushed:						
Dolomite	thousand metric tons	3,389	3,450	3,579	3,695 r	3,490
Limestone	do.	182,255	170,166	163,565	161,858	165,240
Sulfur:						
Byproduct of metallurgy	do.	1,319	1,326	1,281	1,263	1,284
Byproduct of petroleum	do.	2,024	1,865	1,951	1,895	1,972
Talc and related materials:						
Talc		18,478 r	22,142 r	24,328 r	18,253 r	25,491
Pyrophyllite		403,137 r	416,188 r	408,435 r	405,222 r	351,111
Vermiculite[e]		6,500	6,400	6,200	6,200	6,200
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand metric tons	742	755	788	804	805
Coal, bituminous[8]	do.	3,208	1,368	1,338	1,339	1,146
Coke including breeze:						
Metallurgical	do.	38,402	38,417	38,544	38,314	38,095
Gas, natural:						
Gross[9]	million cubic meters	2,521	2,571	2,844	2,883	3,120
Marketed	do.	2,654 r	2,679 r	3,038 r	3,048 r	3,265

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2001	2002	2003	2004	2005[p]
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	4,782	4,548	5,161	5,247	5,774
Refinery products:						
Gasoline:						
Aviation[e]	do.	40	40	50	50	50
Other	do.	364,714	364,129	367,687	366,662	368,102
Asphalt and bitumen	do.	33,151	31,537	32,586	34,475	33,288
Distillate fuel oil	do.	261,851	250,932	242,311	243,425	251,729
Jet fuel	do.	67,320	65,263	60,013	64,846	69,946
Kerosene	do.	176,655	169,472	177,963	167,348	177,091
Liquefied petroleum gas	do.	59,942	53,593	53,107	50,881	56,352
Lubricants	do.	16,304	16,630	16,314	16,561	16,580
Naphtha	do.	116,122	119,298	122,355	125,252	135,792
Paraffin, wax	do.	822	833	915	902	902
Petroleum coke	do.	4,700	4,549	4,000	4,533	4,394
Refinery fuel and losses[e, 10]	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	409,780	398,673	435,763	406,901	400,936
Unfinished oils[e]	do.	50,000	50,000	50,000	50,000	50,000
Total[11]	do.	1,710,000	1,670,000	1,710,000	1,680,000	1,720,000

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [p]Preliminary. [r]Revised. -- Zero.
[1]Table includes data available through October 27, 2006.
[2]Includes unalloyed and alloyed ingot.
[3]Includes recovered from scrap and waste.
[4]Reported figure.
[5]Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.
[6]Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.
[7]Reported figure for fiscal year, which began on April 1 and ended on March 31 of the following year.
[8]All major coal mines had closed by January 2002, but eight smaller mines were still in operation in 2005.
[9]Includes output from gas wells and coal mines.
[10]May include some additional unfinished oils.
[11]Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Economy, Trade and Industry. Yearbook of Iron and Steel, Non-ferrous Metal, and Fabricated Metals Statistics, 2005; Yearbook of Chemical Industries Statistics, 2005; Yearbook of Ceramics and Building Materials Statistics, 2005; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2005. Japan Aluminum Association, Aluminum Statistics, 2005. Arumu Publishing Co. Ltd. Industrial Rare Metals Annual Review No. 122, 2006. U.S. Geological Survey Mineral Questionnaire, 2001-04.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co. Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co. Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co. Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co. Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Apmori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co. Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co. Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co. Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; and Tosa, Kochi Prefecture	28,800
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube, Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd.[1]	Kushiro, Hokkaido Prefecture	750
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	600
Copper, refined	do.	Hibi Kyodo Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	228,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Nippon Mining and Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture; Saganoseki, Oita Prefecture	450,000
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Mitsubishi Materials Corp., 49.29%; Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd.,8.31%; Furukawa Electric Co. Ltd. and Mitsubishi Cable Industries Ltd., 4.17% each; others, 2.91%	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi/Toyo (Saijyo), Ehime Prefecture	365,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining and Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%, and Mitsubishi Corp., 11.2%)	Oami-Shirasato, and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%, and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%, and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%, and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippon Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead:				
In concentrate		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.)[2]	Toyoha, Hokkaido Prefecture	4
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd.[3]	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.)[3]	Hosokura, Miyagi Prefecture	22,200
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture; Hanezuru, Tochigi Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Otia Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	21,000
Do.	do.	Yakin Oheyama Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries Ltd., 75.2%, and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	22
Do.		Toho Titanium Co. Ltd. (Nippon Mining and Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	15
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%, and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Zinc:				
In concentrate		Toyoha Mining Co. Ltd.[2]	Toyoha, Hokkaido Prefecture	42
Refined	metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining and Metals Co. Ltd., 24%; Sumitomo Metal Mining Co. Ltd., 14%; Mitsubushi Materials Corp., 5%)	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; Nippon Mining and Metals Co. Ltd., 27.8%; Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

[1]Coal mining operation continued following establishment of Kushiro Coal Mining Co. Ltd. in 2002.
[2]Lead and zinc mining operations at the Toyoha Mine were scheduled to cease by the end of March 2006.
[3]Secondary lead smelter and refinery.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES AS OF 2005

(Thousand metric tons unless otherwise specified)

Commodity		Exploitable reserves
Coal[1]		773,000
Copper ore, Cu content		28
Dolomite[2]		912,956
Gold ore, Au content	kilograms	159,000
Iodine		5,000 [e]
Lead ore, Pb content		293
Kaolin		5,086
Limestone[3]		40,372,079
Pyrophyllite		59,718
Silica sand[4]		73,623
Silica stone, white[5]		462,028
Silver ore, Ag content		2,300
Zinc ore, Zn content		1,220

[e]Estimated; estimated data are rounded to no more than three significant digits.
[1]Recoverable reserves, including brown coal.
[2]Average ore grade is 17.9% MgO.
[3]Average ore grade is 53.8% CaO.
[4]Average ore grade is 78.0% SiO_2.
[5]Average ore grade is 92.8% SiO_2.

Source: Natural Resources and Fuel Department, Agency of Natural Resources and Energy.

TABLE 4
JAPAN: MINERALS TRADE[1]

(Million dollars)

Code	Commodity	Imports			Exports		
		2003	2004	2005	2003	2004	2005
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,220	1,391	1,529	374	399	489
26	Ferrous and nonferrous metal ores, slag, ash	7,482	10,221	14,425	40	70	86
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral waxes	81,054	99,421	133,362	1,555	2,287	4,461
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements, or of isotopes	3,458	4,339	4,768	2,292	2,706	2,961
31	Fertilizers	530	641	710	86	103	110
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials	1,150	1,168	1,254	1,016	1,251	1,387
69	Ceramic products	760	880	968	912	1,089	1,210
70	Glass and glassware	1,362	1,752	1,870	2,788	3,456	3,774
71	Natural or cultured pearls; precious or semiprecious stones; precious metals, metals clad with precious metals and articles thereof; imitation jewelry; coins	5,705	7,685	8,443	2,149	2,491	3,017
72	Iron and steel	3,093	5,258	6,818	15,717	21,187	24,401
73	Articles of iron and steel	2,852	3,524	4,268	6,225	7,678	9,425
74	Copper and articles thereof	761	1,196	1,216	2,388	3,199	3,864
75	Nickel and articles thereof	1,384	2,187	2,127	458	786	864
76	Aluminum and articles thereof	5,447	6,592	7,200	1,722	1,965	2,027
78	Lead and articles thereof	18	26	41	18	27	24
79	Zinc and articles thereof	63	78	103	89	105	115
80	Tin and articles thereof	156	297	285	56	85	95
81	Other base metals, cermets, articles thereof	840	1,685	1,773	643	859	1,173
	Total	117,335	148,341	232,119	38,528	49,743	59,483
	Total trade	382,761	454,867	516,782	470,650	565,342	595,794

[1]Values have been converted from Japanese yen (¥) to U.S. dollars (US$) at a rate of ¥115.9=US$1.00 for 2003, ¥108.2=US$1.00 for 2004, and ¥110.2=US$1.00 for 2005.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 2003-2005.

TABLE 5
JAPAN: DOMESTIC DEMAND FOR GOLD AND SILVER

Item		2001	2002	2003	2004	2005
Gold:						
Dental and medical	kilograms	20,813	21,765	22,373	21,383	20,881
Electrical, electronic, and communication	do.	70,916	80,415	85,112	86,315	100,718
Gold plating	do.	22,615	22,513	23,512	23,612	20,118
Jewelry	do.	37,512	37,128	20,489	20,189	20,451
Decorations and badges	do.	1,474	1,392	1,499	1,412	1,244
Pottery and porcelain	do.	975	1,149	1,532	1,420	1,415
Fountain pens	do.	14	15	15	--	--
Watches	do.	778	785	790	786	799
Industrial arts and crafts	do.	4,893	4,697	4,879	4,653	4,785
Private hoarding	do.	69,586	85,569	79,481	80,526	80,983
Other	do.	32,919	47,755	48,317	49,302 r	46,723
Total	do.	262,495	303,183	287,999	289,598	298,117
Silver:						
Silver nitrate for photography	metric tons	1,663	1,532	1,365	1,243	969
Silver nitrate for other uses	do.	150	220	295	307	299
Electrical contacts	do.	202	153	219	260	209
Brazing alloy	do.	111	98	95	105	102
Rolled products	do.	193	216	228	248	214
Other	do.	636	455	474	434	386
Total	do.	2,955	2,674	2,676	2,597	2,179

-- Zero.

Sources: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, Nos. 120, 121, and 122; Ministry of Economy, Trade and Industry, Yearbook of Iron and Steel, Nonferrous Metals, and Fabricated Metals Statistics, 2005.

TABLE 6
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	2001	2002	2003	2004	2005
Automobiles:					
Ordinary steel	9,430	10,310	10,580	10,760	11,140
Specialty steel	2,590	2,990	3,230	3,640	4,150
Total	12,020	13,300	13,810	14,400	15,290
Construction:					
Ordinary steel	13,550	13,580	13,300	13,380	13,130
Specialty steel	720	640	710	720	690
Total	14,270	14,220	14,010	14,100	13,820
Conversion and processing:					
Ordinary steel	2,910	2,790	2,760	2,800	2,560
Specialty steel	3,260	3,560	3,880	4,340	4,790
Total	6,170	6,350	6,640	7,140	7,350
Electric machinery and equipment:					
Ordinary steel	1,940	1,840	1,940	2,030	2,010
Specialty steel	130	130	160	180	160
Total	2,070	1,970	2,100	2,210	2,170
Home and office appliances:					
Ordinary steel	550	540	580	610	600
Specialty steel	210	200	200	190	180
Total	760	740	780	800	780
Industrial machinery and equipment:					
Ordinary steel	1,290	1,360	1,650	1,920	2,070
Specialty steel	940	980	1,180	1,390	1,460
Total	2,230	2,340	3,830	3,310	3,530
Shipbuilding and marine equipment:					
Ordinary steel	3,480	3,420	3,530	4,290	4,860
Specialty steel	140	180	210	140	140
Total	3,620	3,600	3,740	4,430	5,000
Steel dealers:					
Ordinary steel	17,930	17,480	17,070	17,400	16,510
Specialty steel	1,230	1,210	1,350	1,470	1,440
Total	19,160	18,690	18,420	18,870	17,950
Tanks and containers:					
Ordinary steel	1,620	1,560	1,600	1,600	1,440
Specialty steel	20	20	20	30	40
Total	1,640	1,580	1,620	1,630	1,480
Other:					
Ordinary steel	570	500	410	430	420
Specialty steel	110	110	120	140	120
Total	680	610	530	570	540
Total domestic demand:					
Ordinary steel	53,270	53,380	53,420	55,220	54,740
Specialty steel	9,350	10,020	11,060	12,240	13,170
Grand total	62,620	63,400	64,480	67,460	67,910

Source: The Japan Iron and Steel Federation, The Steel Industry of Japan 2004-2006.

TABLE 7
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY PRINCIPAL DESTINATION

(Thousand metric tons)

Destinations	2001	%	2002	%	2003	%	2004[r]	%	2005	%
China	4,566	15.0	6,532	18.0	6,435	18.7	6,894	19.5	5,783	17.7
Korea, Republic of	6,537	21.5	9,198	25.3	8,978	26.1	8,952	25.4	7,738	23.7
Taiwan	2,528	8.3	3,263	9.0	3,280	9.5	3,235	9.2	3,605	11.1
Thailand	2,572	8.4	3,350	9.2	3,593	10.4	3,863	11.0	4,099	12.6
Middle East	1,523	5.0	1,074	3.0	1,172	3.4	1,001	2.8	1,383	4.2
Europe	1,193	3.9	715	2.0	742	2.2	1,098	3.1	768	2.4
United States	2,206	7.2	1,485	4.1	1,076	3.1	1,428	4.0	1,451	4.4
All other countries	9,353	30.7	10,706	29.4	9,135	26.6	8,831	25.1	7,778	23.9
Total	30,478	100.0	36,323	100.0	34,411	100.0	35,302	100.0	32,605	100.0

[r]Revised.

Source: The Japan Iron and Steel Federation, Monthly Report of the Iron and Steel Statistics and The Steel Industry of Japan 2001-05.

TABLE 8
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2005

	Australia			Canada	
				British Columbia	
	Cadia Hill/Ridgeway	McArthur River, Northern Territory[1]	Northparkes, New South Wales	Mount Polley[2]	Huckleberry
Nature of project involvement	Long-term loan	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan
Participating Japanese companies and their equity share	Pan Pacific Copper Co. Ltd.	ANT Minerals Pty Ltd., 25% ANT Minerals was 50% owned by Nippong Mining & Metals Co Ltd., 16.7% owned each by three other Japanese companies	Sumitomo Metal Mining Oceania Pty., 13.3%, and SC Mineral Resources Ltd. of Australia, 6.7%	Sumitomo Corp. sold its 47.5% equity interest to Imperial Metals Corp. in 2000	Mitsubishi Materials Corp., 31.25%; Dowa Mining Co. Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; Marubeni Corp., 6.25%.
Majority equity holder and/or other equity holder	NewCrest Mining Co. Ltd.	Mount Isa Mines Ltd. (MIM), 75% MIM was part of Xstrata Zinc	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 100%[1]	Princeton Mining Corp. of Canada, 50%.
Mineral commodity involved	Copper and gold	Lead, silver, and zinc	Copper and gold	Copper and gold	Copper.
Estimated reserves and ore grade	Cadia, 210 million metric tons, 0.18% copper, 0.72 gram per metric ton gold; Ridgeway, 41 million metric tons, 0.75% copper, 2.7 grams per metric ton gold	39.9 million metric tons, 5.5% lead, 12.6% zinc, 55 grams per metric ton silver	63.7 million metric tons, 1.108% copper, 0.487 gram per metric ton gold	81.5 million metric tons, 0.3% copper, 0.42 gram per metric ton gold	56.5 million metric tons, 0.494% copper, 0.014% molybdenum.
Type of mine	Cadia, open pit; Ridgeway, underground	Underground	Open pit and underground	Open pit	Open pit.
Total cost of the project	$726 million (Australian) (Cadia and Ridgeway)	$296 million (Australian)	$303 million (Australian)	$123 million (Canadian)	$136 million (Canadian).
Japanese share	$160 million (in cash)	$29 million (Australian)	$75.6 million (Australian)	$109 million (Canadian)	$78 million (Canadian).
Annual production capacity	250,000 metric tons of copper concentrate (Cadia and Ridgeway)	1,270,000 metric tons of crude ore containing 6.1% lead, 15.4% zinc	3,934,000 metric tons of crude ore containing 1.73% copper plus 0.88 gram per metric ton gold	6,500,000 metric tons of crude ore	7,145,600 metric tons of crude ore continuing 0.502% copper, 0.013% molybdenum.
Annual shipment to Japan	50,000 metric tons of copper and 11 metric tons of gold	4,338 metric tons of lead and 23,052 metric tons of zinc in mixed concentrate	22,098 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate plus gold value	28,277 metric tons of copper in concentrate.
Construction started	Cadia, 1996; Ridgeway, 2000	August 1993	May 1993	September 1996	1996.
Production started or planned	Cadia, 1998; Ridgeway, 2002	September 1995	October 1995	June 1997	October 1997.

See footnotes at end of table.

TABLE 8--Continued
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2005

	Chile				
		Region III			
	Collahuasi, Region I	La Candelaria	Atacama Kozan	Ojos del Salado	Los Pelembres, Region IV
Nature of project involvement	Equity participation and provided loan	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation.
Participating Japanese companies and their equity share	Mitsui and Co. Ltd., 7.4%; Mitsui Mining and Smelting Co. Ltd., 1.0%; Nippon Mining and Metals Co., Ltd., 3.6%	Sumitomo Metal Mining Co. Ltd., 16%, and Sumitomo Corp., 4%	Nittetsu Mining Co. Ltd., 60%	Sumitomo Metal Mining Co. Ltd., 16%, and Sumitomo Corp., 4%	Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui and Co. Ltd., 1.25%.
Major equity holder and/or other equity holder	Falconbridge Ltd. of Canada, 44%, and Anglo American plc of the United Kingdom, 44%	Phelps Dodge Corp. of the United States, 80%	Inversiones Errazuriz Ltda. of Chile, 40%	Phelps Dodge Corp. of the United States, 80%	Antofagasta plc of the United Kingdom, 60%.
Mineral commodity involved	Copper	Copper and gold	Copper	Copper	Copper.
Estimated reserves and ore grade	1,808.2 million metric tons, 0.91% copper	366 million metric tons, 0.84% copper, 0.205 gram per metric ton gold	30 million metric tons, 1.5% copper, 0.26 gram per metric ton gold	17 million metric tons, 1.32% copper, 0.27 gram per metric ton gold	2,074 million metric tons, 0.65% copper.
Type of mine	Open pit	Open pit	Underground	Underground	Open pit.
Total cost of the project	$1,760 million	$592 million	$111 million	Estimated cost $125 million	$1,360 million.
Japanese share	$375 million	$296 million	$101 million	$25 million	$614 million.
Annual production capacity	25,600,000 metric tons of crude ore	10,000,000 metric tons of crude ore	1,650,000 metric tons of crude ore	60,000 metric tons of copper concentrate	34,000,000 metric tons of crude ore.
Annual shipment to Japan	96,023 metric tons of copper in concentrate	85,313 metric tons of copper in concentrate	13,000 metric tons of copper in concentrate	12,000 metric tons of copper concentrate	163,200 metric tons of copper in concentrate.
Construction started	1996	April 1993	May 1999	1920, but ceased operations in 1998	November 1997.
Production started or planned	January 1999	March 1995	June 2003	2004 resumed operations	April 2000.

See footnotes at end of table.

TABLE 8--Continued
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2005

	Indonesia, Batu Hijau, Sumbawa Island	Mexico	
		Tizapa, Mexico City	Rey de Plata, Guerrero
Nature of project involvement	Equity participation	Investment in exploration and development	Investment in exploration and development.
Participating Japanese companies and their equity share	Sumitomo Corp., 26%; Sumitomo Metal Mining Co. Ltd., 5.0%; Mitsubishi Materials Corp., 2.5%; Furukawa Co. Ltd., 1.5%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%.
Majority equity holder and/or other equity holder	Newmont Gold Co. of the United States, 45%, and P.T. Pukuafu Indah of Indonesia, 20%	Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%.
Mineral commodity involved	Copper and gold	Copper, lead, and zinc	Copper, lead, and zinc.
Estimated reserves and ore grade	907.3 million metric tons, 0.44% copper, 0.377 gram per metric ton gold	2.5 million metric tons, 0.61% copper, 1.36% lead, 6.56% zinc plus gold and silver	2.9 million metric tons, 0.68% copper, 2.56% lead, 8.78% zinc plus gold and silver.
Type of mine	Open pit	Underground	Underground.
Total cost of the project	$1,925 million	$38.2 million	$45.4 million.
Japanese share	$513 million	$35.1 million	$41.3 million.
Annual production capacity	43,870,000 metric tons of crude ore containing 0.75% copper and 0.44 gram per metric ton gold	480,000 metric tons of crude ore	330,000 metric tons of crude ore.
Annual shipment to Japan	92,128 metric tons of copper in concentrate	23,500 metric tons of zinc in concentrate	21,985 metric tons of zinc in concentrate.
Construction started	September 1996	May 1992	January 1998.
Production started or planned	October 1999	November 1994	October 2000.

See footnotes at end of table.

TABLE 8--Continued
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2005

	Peru			The Philippines	United States
	Antamina, Ancash	Cerro Verde, Arequipa	Pallca, Ancash	Padcal, Luzon	Pogo, Alaska
Nature of project involvement	Investment in exploration and development	Equity participation (planned)	Equity participation	Long-term loan	Mine owned by Sumitomo Metal Mining Co. Ltd.
Participating Japanese companies and their equity share	Mitsubishi Corp., 10%	Sumitomo Metal Mining Co. Ltd., 21% (planned)	Mitsui & Co. Ltd., 30%	Pan Pacific Copper Co. Ltd.	Teck Cominco Co., 40%, and SC America Minerals, Inc., 9%.
Major equity holder and/or other equity holder	Noranda Inc. of Canada and BHP Billiton plc of the United Kingdom, 33.75% each, and Teck Cominco Ltd. of Canada, 22.5%	Phelps Dodge Corp., 53.6%; Compania de Minas Buenaventura S.A.A., 18.2%; others, 7.2%	Mitsui Mining and Smelting Co. Ltd., 70%	Philex Mining Corp.	Sumitomo Metal Mining America Inc., 51%.
Mineral commodity involved	Copper and zinc	Copper	Lead and zinc	Copper and gold	Gold.
Estimated reserves and ore grade	559 million metric tons, 1.23% copper, 1.03% zinc, 0.03% molybdenum	1,033 million metric tons, 0.514% copper, 0.01% molybdenum	6 million metric tons, 1% lead, 12% zinc	34.9 million metric tons, 0.28% copper, 0.78 gram per metric ton gold	152 metric tons.
Type of mine	Open pit	Open pit	Underground	Underground	Underground.
Total cost of the project	$2,296 million	$850 million	$6.2 million	$15 million	$280 million.
Japanese share	$404 million	About $265 million	Unknown	$15 million	$168 million.
Annual production capacity	25,600,000 metric tons of crude ore	180,000 metric tons of copper in concentrate	170,000 metric tons of crude ore	8,970,000 metric tons of crude ore (0.28% Cu, 0.41 g/t Au) or 70,000 metric tons of copper copper concentrate	12 metric tons of gold.
Annual shipment to Japan	10,579 metric tons of copper in concentrate	Approximately 90,000 metric tons of copper in concentrate	Unknown	15,000 metric tons of copper and 2 metric tons of gold in copper concentrate	Unknown.
Construction started	1998	Unknown	2005	December 2003	June 2004.
Production started or planned	June 2001	Fourth quarter of 2006	March 2006	2006	March 2006.

[1]ANT Minerals Pty Ltd. (50% owned by Nippon Mining & Metal Co. Ltd., and 16.7% owned each by Marubeni Corp., Mitsui & Co. Ltd., and Toyoha Mining Co. Ltd.), which owned 25% interest in McArthur River Mine, sold all its interest to Xstrata plc through Mount Isa Mines Ltd., which was part of Xstrata Zinc (one of the Xstrata plc companies), in September 2005.

[2]SC Minerals Canada Ltd. (a wholly owned subsidiary of Sumitomo Corp.) sold its 47.5% interest in Mount Polley Copper Project to Imperial Metals Corp. of Canada for $4.5 million by the end of 2000.

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2002, p. 210-217; Japan Oil, Gas and Metals National Corp., Metal Mining Data Book, 2005, p. 196-201.

TABLE 9
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2004	2005	Destinations, 2005	
			United States	Other, principal
METALS				
Alkali and alkaline-earth metals	196	138	8	China 93; Thailand 6; Other 19.
Aluminum:				
Ore and concentrate	915	673	--	Republic of Korea 300; China 40; Other 320.
Oxides and hydroxides	285,508	259,647	3,585	Republic of Korea 115,577; China 51,321; Other 34,340.
Ash and residue containing aluminum	27,540	30,933	--	China 28,899; Republic of Korea 1,157; Indonesia 740.
Metal, including alloys:				
Scrap	79,001	95,664	46	China 85,070; Hong Kong 5,331; Republic of Korea 2,813.
Unwrought	36,303	34,419	1,012	Thailand 12,018; Republic of Korea 4,695; China 4,560.
Semimanufactures, all forms	309,469	275,967	23,159	China 66,906; Thailand 43,247; Malaysia 30,008.
Antimony:				
Ore and concentrate	904	--	--	NA.
Oxides	2,578	2,151	175	Malaysia 265; Thailand 265; Singapore 258.
Metal, including alloys, all forms[2]	464	264	1	Thailand 10; Indonesia 6; Other 244.
Arsenic, metal, including alloys, all forms	5	5	3	Republic of Korea 1; United Kingdom 1.
Beryllium, metal, including alloys, all forms	8	17	8	China 6; Other 3.
Bismuth, metal, including alloys, all forms[2]	39	60	--	Belgium 14; United Kingdom 12; China 11.
Cadmium, metal, including alloys, all forms	1,411	1,503	620	China 466; Republic of Korea 189; France 78.
Chromium:				
Ore and concentrate	191	32	--	Republic of Korea 24; Philippines 5; Thailand 3.
Oxides and hydroxides	6,032	5,988	725	Republic of Korea 3,007; Thailand 284; Other 1,163.
Metal, including alloys, all forms	907	1,626	479	China 624; United Kingdom 207; Other 127.
Cobalt:				
Oxides and hydroxides	1,206	850	4	China 582; Finland 130; Republic of Korea 45.
Metal, including alloys, all forms	2,095	2,495	264	Canada 888; China 590; United Kingdom 174.
Columbium (niobium) and tantalum, tantalum metal, including alloys, all forms	445	389	126	Germany 54; Israel 54; Thailand 35.
Copper:				
Ore and concentrate	-- [r]	--	--	NA.
Matte, including cement copper	(3)	979	--	China 519; Republic of Korea 461.
Oxides and hydroxides	1,988	2,178	4	Republic of Korea 757; Malaysia 694; China 370.
Sulfate	4,325	3,731	18	Republic of Korea 421; Hong Kong 339; Other 2,498.
Ash and residue containing copper	--	2	--	Hong Kong 2.
Metal, including alloys:				
Scrap	329,909	424,054	102	China 385,129; Hong Kong 13,518; Republic of Korea 13,222.
Unwrought	227,785	289,385	6,890	China 102,339; Republic of Korea 44,569; Other 108,583.
Semimanufactures, all forms	308,680	276,663	11,226	China 61,859; Malaysia 35,786; Other 3,094.
Germanium, metal, including alloys, all forms	6	2	(3)	China 1; Other 1.
Gold, metal, including alloys, unwrought and partly wrought	90	107	(3)	Malaysia 21; Singapore 21; Othe 17.
Iron and steel:				
Iron ore and concentrate	591	54,910	--	Vietnam 41,200; Thailand 7,700; Other 5,903.
Metal:				
Scrap thousand metric tons	6,809	7,576	(3)	China 3,461; Republic of Korea 2,874; Other 875.
Pig iron, cast iron, related materials	85,843 [r]	86,223	4,619	Republic of Korea 40,530; China 16,309; Thailand 12,734.
Ferroalloys:				
Ferrochromium	2,597	3,495	3,073	Indonesia 33; Thailand 288; Republic of Korea 25.
Ferromanganese	9,870	9,649	3,300	Malaysia 1,400; Thailand 1,122; Other 2,552.
Ferromolybdenum	43	331	--	Thailand 118; Malaysia 56; Other 54.

See footnotes at end of table.

TABLE 9--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Destinations, 2005	
				United States	Other, principal
METALS--Continued					
Iron and steel--Continued:					
Metal--Continued:					
Ferroalloys--Continued:					
Ferronickel		111,024	125,625	--	Republic of Korea 60,784; China 12,217; Other 52,625.
Ferrosilicochromium		1,097	--	--	NA.
Ferrosilicomanganese		168	12	--	China 3; Other 9.
Ferrosilicon		7,391	2,070	--	Republic of Korea 862; Indonesia 757; China 171.
Ferrotungsten		2	(3)	--	All to Thailand.
Silicon metal		902	1,052	7	China 641; United Kingdom 33; Other 116.
Lead:					
Ore and concentrate		3,401 r	6,140	--	China 6,137; Philippines 3.
Oxides		618	637	4	Malaysia 279; Thailand 160; Germany 90.
Ash and residue		--	338	--	All to Republic of Korea.
Metal, including alloys:					
Scrap		19,635	8,900	--	Republic of Korea 5,831; China 2,878; Malaysia 191.
Unwrought		19,401	14,662	228	China 5,997; Indonesia 3,092; Hong Kong 2,173.
Semimanufactures		1,140	1,166	7	Indonesia 140; China 136; Other 753.
Lithium:					
Oxide and hydroxide		17	263	--	Republic of Korea 126; China 117; Germany 11.
Magnesium, metal, including alloys:					
Scrap		23	40	--	All to United Kingdom.
Unwrought	value, thousands	$657	$735	$3	Republic of Korea $65; Canada $18; Other $619.
Semimanufactures		2,098	482	2	China 449; Republic of Korea 10; Other 11.
Manganese:					
Ore and concentrate		42,244	31,226	--	All to China.
Oxides		29,229	29,366	4,954	Indonesia 9,624; Singapore 6,930; China 2,658.
Metal, including alloys, all forms		261	1,028	11	Republic of Korea 946; China 28; Philippines 12.
Mercury		54	107	--	Netherlands 86; India 9; Kenya 4.
Molybdenum:					
Ore and concentrate:					
Roasted		2	684	--	Republic of Korea 547; Italy 119; India 18.
Unroasted	value, thousands	$11 r	$20	--	Singapore $12; Thailand $4; Vietnam $4.
Oxides and hydroxides		132	155	36	Kuwait 10; Singapore 4; Other 99.
Metal, including alloys, all forms		486 r	689	62	Republic of Korea 271; Austria 51; Other 225.
Nickel:					
Ore and concentrate	value, thousands	$72	$2	--	All to Thailand.
Matte and speiss		32,682	34,546	--	Republic of Korea 18,118; United Kingdom 440; Other 15,743.
Oxides and hydroxides		6,731	6,130	547	China 3,349; Hong Kong 752; Other 749.
Metal, including alloys:					
Scrap		400	1,125	319	United Kingdom 521; Vietnam 105; China 41.
Unwrought		1,433	2,111	1	China 1,083; Hong Kong 482; Republic of Korea 91.
Semimanufactures		15,915	15,693	843	China 2,130; Germany 563; Hong Kong 499.
Platinum-group metals, including alloys, unwrought and partly wrought:					
Palladium	value, thousands	$52	$42	$7	Austria $10; Republic of Korea $10; China $4.
Platinum	do.	$144	$267	$6	Hong Kong $115; China $77; Thailand $15.
Rhodium	do.	$3	$30	(3)	China $22; Hong Kong $2; Thailand $2.
Iridium, osmium, ruthenium		$2	$4	(3)	Mainly to Singapore.
Rare-earth, metal, including alloys, all forms		277	592	(3)	Philippines 548; China 20; Hong Kong 15.
Selenium		539	435	4	China 189; Hong Kong 76; India 50.
Silicon		6,175	5,742	487	United Kingdom 1,715; China 878; Republic of Korea 756.

See footnotes at end of table.

TABLE 9--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Destinations, 2005: United States	Destinations, 2005: Other, principal
METALS--Continued					
Silver:					
Ore and concentrate		--	104	--	All to Belgium.
Metal, including alloys, unwrought and partly wrought	value, thousands	$181	$238	$20	Hong Kong $50; China $30; Other $56.
Tin, metal, including alloys:					
Scrap		600	523	--	Belgium 227; United Arab Emirates 194; Hong Kong 44.
Unwrought		973	1,083	1	Philippines 364; China 229; Vietnam 114.
Semimanufactures		2,944	2,862	132	China 846; Republic of Korea 337; Japan 171.
Titanium:					
Ore and concentrate		84	86	--	Singapore 31; Germany 4; Other 49.
Oxides		31,058	26,334	1,073	China 9,486; Republic of Korea 2,250; Other 7,227.
Metal, including alloys, all forms		23,203 r	25,231	10,396	United Kingdom 3,219; China 1,942; Republic of Korea 1,871.
Tungsten:					
Ore and concentrate		533	188	--	China 184; Other 4.
Metal, including alloys, all forms		2,287	2,474	365	China 672; Germany 441; Other 400.
Uranium and thorium, metal, including alloys, all forms		1	--	--	NA.
Vanadium:					
Oxides and hydroxides		221	385	1	Republic of Korea 354; Thailand 6; Other 6.
Metal, including alloys, all forms		32	14	(3)	Mainly to Singapore.
Zinc:					
Ore and concentrate		3,013	4,607	--	All to China.
Oxides		2,416	2,309	62	Thailand 517; China 433; Other 203.
Blue powder		10	88	--	Mainly to Other Asia, nes.
Ash and residue containing zinc		2,379	6,655	--	Republic of Korea 1,095; China 5,162; Thailand 122.
Metal, including alloys:					
Scrap		3,617	3,898	--	China 3,536; Republic of Korea 39; Other 260.
Unwrought		76,188	65,371	4	Indonesia 16,042; Vietnam 5,834; Other 22,183.
Semimanufactures		3,343	4,487	339	China 1,428; Indonesia 941; Singapore 494.
Zirconium:					
Ore and concentrate		1,143	1,741	3	Mainly to China.
Metal, including alloys, all forms		50	99	9	Thailand 64; Hong Kong 5; Other 5.
INDUSTRIAL MINERALS					
Abrasives (not elsewhere specified):					
Natural, corundum, emery, pumice, and so forth		28,873	31,152	55	Republic of Korea 14,043; China 10,388; Other 3,416.
Artificial:					
Corundum		22,202	19,038	1,658	Republic of Korea 4,902; China 3,130; Malaysia 2,082.
Silicon carbide		9,123	10,531	1,382	Republic of Korea 2,991; Malaysia 964. Other 1,713.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$251	$289	$46	Hong Kong $35; Other $156.
Grinding and polishing wheels and stones		10,381	10,103	1,063	Indonesia 1,891; Republic of Korea 1,301; Thailand 925.
Asbestos, crude	value, thousands	$4	$37	--	China $21; Hong Kong $11.
Barite and witherite	do.	$27	$32	$23	Mainly to Vietnam.
Boron materials:					
Crude natural borates	do.	$61	$56	--	China $27; Singapore $20.
Oxides and acids		343	397	84	Republic of Korea 157; China 19; Othe 102.
Cement	thousand metric tons	10,313	10,197	4	Hong Kong 1,758; Republic of Korea 1,508; Singapore 1,207.
Chalk		1,921	1,683	--	Republic of Korea 936; Indonesia 414; Other 210.

See footnotes at end of table.

TABLE 9--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Destinations, 2005	
				United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Clays, crude:					
Bentonite		2,814	4,465	48	Thailand 1,890; Indonesia 1,524; Other 336.
Chamotte or dinas earth		54	13	--	Mainly to Republic of Korea.
Fire clay		3,175	2,599	1	Republic of Korea 839; Thailand 415; Other 385.
Fuller's earth		2	1	--	All to China.
Kaolin		4,731	10,055	42	China 6,836; Egypt 472; Other 1,189.
Unspecified		22,290	29,035	2,533	Indonesia 6,556; Vietnam 4,434; Other 3,637.
Diamond, natural:					
Gem, not set or strung	value, thousands	$27,810	$40,006	$12,001	Hong Kong $17,759; Israel $402; Republic of Korea $394.
Industrial stones	do.	$2,908	$3,073	$148	Republic of Korea $340; China $233; Other $672.
Dust and powder	do.	$7,970	$8,328	$5,349	China $1,083; Republic of Korea $821; Thailand $548.
Diatomite and other infusorial earth		3,673	3,763	853	Vietnam 685; Thailand 615; Other 714.
Feldspar		2,466	2,432	--	Thailand 766; Hong Kong 211; Malaysia 83.
Fluorspar	value, thousands	$457	$1,507	$5	Germany $1,127; Singapore $280; Thailand $50.
Fertilizer materials:					
Crude (not elsewhere specified)		10,653	20,891	1	China 17,960; Republc of Korea 1,651; Other 382.
Manufactured:					
Ammonia		6,669	8,353	1,181	Republic of Korea 1,906; Singapore 1,418; Other 2,427.
Nitrogenous		869,615	855,099	1,993	Vietnam 289,600; Malaysia 260,197; Thailand 54,852.
Phosphatic		400	419	97	China 187; Other 90.
Potassic		444	283	162	Indonesia 42; Republic of Korea 39; Other 30.
Graphite, natural		1,579	1,702	210	Republic of Korea 522; Brazil 172; China 171.
Gypsum and plaster		4,267	4,114	61	Bangladesh 1,481; Republic of Korea 728; Other 559.
Iodine		5,211	5,091	1,366	Norway 702; United Kingdom 564; France 537.
Kyanite and related materials, mullite and unspecified		3,870	2,575	13	Republic of Korea 1,768; China 134; Other 219.
Lime		4,378	4,642	219	Singapore 1,197; Republic of Korea 891; Other 1,391.
Magnesium compounds:					
Magnesite, crude		90	90	--	Thailand 36; Republic of Korea 30; Other 24.
Oxides and hydroxides		48,499	46,545	5,616	Republic of Korea 13,957; China 5,940; Other 6,658.
Mica:					
Crude including splittings and waste		1,377	1,963	350	Thailand 466; China 454; Republic of Korea 169.
Worked including agglomerated splittings		1,883	1,408	11	Austria 624; Republic of Korea 109; Other 104.
Nitrates, crude		1,628	2,899	--	Indonesia 1,227; Thailand 646; China 309.
Phosphates, crude		9	12	--	All to Vietnam.
Phosphorus, elemental		31	40	2	Mainly to Republic of Korea.
Pigments, mineral, iron oxides and hydroxides processed		43,306	43,818	4,709	China 25,864; Republic of Korea 4,510; Hong Kong 2,407.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$8,589	$4,267	$370	Thailand $463; Australia $225; Other $1,083.
Synthetic	do.	$51,925	$52,779	$5,549	China $6,703; Hong Kong $6,034; Other $15,482.
Pyrite, unroasted		18	43	--	China 22; Hong Kong 6; New Zealand 6.
Quartz crystal, piezoelectric	value, thousands	$41,682	$43,146	$9,621	Singapore $12,598; Hong Kong $6,059; Philippines $2,919.
Salt and brine		1,562	1,074	23	China 301; Republic of Korea 256; Singapore 166.

See footnotes at end of table.

TABLE 9--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Destinations, 2005	
				United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		37,259	52,864	7	Mainly to China.
Worked	value, thousands	$2,144	$2,185	$210	Republic of Korea $543; China $519; Ukraine $303.
Dolomite, chiefly refractory-grade		799	1,918	--	Thailand 20; Other 1,880.
Gravel and crushed rock		6,301	5,796	19	Republic of Korea 4,540; Bangladesh 141; Other 858.
Limestone other than dimension	thousand metric tons	2,994	3,317	--	Republic of Korea 850; Australia 556; Other 1,841.
Quartz and quartzite		4,237	3,558	2	Republic of Korea 1,009; Singapore 828; Germany 800.
Sand other than metal-bearing and sand and gravel		18,804	16,119	101	Indonesia 2,664; Thailand 1,358; Other 3,153.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand metric tons	1,160	1,263	--	China 895; Indonesia 138; Republic of Korea 136.
Colloidal, precipitated, sublimed		1,993	1,725	480	Indonesia 360; Italy 340; Mexico 240.
Dioxide		2	15	--	Mainly to China.
Sulfuric acid	thousand metric tons	1,158	1,378	40	China 722; Chile 164; Other 189.
Talc, steatite, soapstone, pyrophyllite		10,229	10,858	424	China 1,929; Singapore 1,864; Hong Kong 1,682.
Vermiculite, perlite, chlorite		20,194	14,256	117	Republic of Korea 12,709; Other 1,059.
Other: Slag and dross, not metal-bearing	thousand metric tons	7,704	8,312	498	Republic of Korea 1,241; United Arab Emirates 803; Other 2,646.

NA Not available. [r]Revised. -- Zero.
[1]Data presented in this table are from United Nations, Department of Economic and Social Affairs, Statistics Division.
[2]Includes waste and scrap.
[3]Less than 1/2 unit.

TABLE 10
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2004	2005	Sources, 2005: United States	Sources, 2005: Other, principal
METALS				
Alkali and alkaline-earth metals	648	888	165	China 269; Russia 44; Germany 11.
Aluminum:				
Ore and concentrate	1,945,759	1,814,123	--	Ausrtalia 810,289; Indonesia 676,755; India 242,480.
Oxides and hydroxides	120,981	136,415	8,882	Australia 91,008; China 10,561; Republic of Korea 9,117.
Ash and residue	8,710	9,360	--	Indonesia 3,055; Thailand 2,998; Republic of Korea 1,462.
Metal, including alloys:				
Scrap	105,681	108,785	36,263	United Kingdom 13,259; Singapore 7,954; Saudi Arabia 8,078.
Unwrought	3,021	2,977	8	Russia 748; Australia 562; China 319.
Semimanufactures	90,777	98,429	15,223	Republic of Korea 31,325; China 9,360; Germany 7,514.
Antimony:				
Ore and concentrate	10	50	--	China 40; Vietnam 10.
Oxides	7,977	7,855	(2)	China 6,998; Mexico 594; Other 183.
Metal, including alloys, all forms	8,176	7,435	--	China 7,413; Other 22.
Arsenic, metal, including alloys, all forms	20	22	--	China 20; Germany 2.
Beryllium, metal, including alloys, all forms	7	7	(2)	Republic of Korea 3; Thailand 3; China 1.
Bismuth	935	911	10	China 517; Peru 207; Belgium 101.
Cadmium, metal, including alloys, all forms	2,668	3,515	(2)	Republic of Korea 1,033; Canada 666; Mexico 573.
Chromium:				
Ore and concentrate	271,284	104,004	--	India 55,500; South Africa 26,108; Pakistan 12,390.
Oxides and hydroxides	4,196	4,474	96	China 2,653; Kazakhstan 720; United Kingdom 605.
Metal, including alloys, all forms	2,668	4,965	994	China 2,841; France 488; United Kingdom 377.
Cobalt:				
Ore and concentrate	10	63	--	Netherlands 29; China 15; United Kingdom 13.
Oxides and hydroxides	2,626	1,478	433	Belgium 352; Other 339.
Metal, including alloys, all forms	15,181	13,318	326	Finland 4,151; Australia 2,431; Canada 2,203.
Columbium (niobium) and tantalum, tantalum metal, including alloys, all forms	263	226	55	Thailand 92; China 30; Republic of Korea 14.
Copper:				
Ore and concentrate thousand metric tons	4,457	4,320	57	Chile 1,939; Indonesia 825; Australia 428.
Matte, including cement copper	15,046	1,977	--	Vietnam 1,042; Malaysia 545; Other 390.
Oxides and hydroxides	2,618	2,907	2,159	Malaysia 227; Vietnam 201; Republic of Korea 100.
Sulfate	1,798	3,690	20	China 2,804; Thailand 202; Other 526.
Ash and residue containing copper	6,772	6,323	3,598	Malaysia 1,356; Indonesia 483; Philippines 411.
Metal, including alloys:				
Scrap	145,102	102,858	16,729	Philippines 17,489; Singapore 15,086; Thailand 14,672.
Unwrought	97,677	80,280	484	Chile 36,335; Peru 16,975; Republic of Korea 7,206.
Semimanufactures, all forms	82,724	86,318	2,787	Republic of Korea 24,770; China 21,058; Malaysia 13,450.
Germanium, metal, including alloys, all forms	9	22	(2)	China 17; Republic of Korea 3.
Gold, metal, including alloys, unwrought and partly wrought	80	80	11	Switzerland 32; Australia 18; Uzbekistan 6.
Iron and steel:				
Iron ore and concentrates thousand metric tons	134,884	181,442	18,387	Republic of Korea 41,925; Thailand 12,190; Other 59,602.
Metal:				
Scrap do.	261	181	18	Republic of Korea 42; Thailand 12; Other 60.
Pig iron, cast iron, related materials	693,736	1,159,396	8,407	China 880,108; Brazil 57,165; Other 68,892.
Ferroalloys:				
Ferrochromium	2,597 r	3,495	176	Thailand 288; Indonesia 34; Republic of Korea 25.
Ferromanganese	51,204	52,256	--	Australia 19,612; South Africa 13,590; China 12,134.
Ferromolybdenum	5,066	4,119	--	China 3,345; Chile 520; Republic of Korea 118.
Ferronickel	55,602	48,241	--	New Caldonia 32,044; Colombia 8,505; Dominican Republic 5,212.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Sources, 2005	
				United States	Other, principal
METALS--Continued					
Iron and steel--Continued:					
Metal--Continued:					
Ferroalloys--Continued:					
Ferrosilicochromium		4,230	2,160	--	All from China.
Ferrosilicomanganese		300,452	234,400	--	China 134,081; Ukraine 41,486; Republic of Korea 12,814.
Ferrosilicon		562,840	486,689	--	China 366,136; Brazil 64,993; Russia 31,926.
Ferrotungsten		1,329	1,529	--	China 1,508; Hong Kong 20; United Kingdom 1.
Silicon metal		242,442	222,851	410	China 191,223; Norway 13,513; Australia 6,744.
Lead:					
Ore and concentrate		140,716	171,606	81,953	Australia 64,308; Peru 10,968; Bolivia 6,076.
Oxides		21,802	11,410	27	China 4,144; Indonesia 1,821; Other 4,792.
Metal, including alloys:					
Unwrought		14,811	23,113	14	China 21,879; Mexico 942; Peru 258.
Semimanufactures		2,106	3,159	4	Republic of Korea 7,687; China 2,314; France 625.
Lithium, oxides and hydroxides:		1,497	1,503	1,318	China 133; Russia 45; New Zealand 8.
Magnesium, metal, including alloys:					
Scrap		1,620	458	--	Malaysia 81; China 49; Other 327.
Unwrought		42,130	35,528	16	Norway 34,192; China 33,395; Canada 1,226.
Semimanufactures		10,272	12,283	131	China 11,844; Russia 290; United Kingdom 6.
Manganese:					
Ore and concentrate	thousand metric tons	1,259	1,326	--	South Africa 833; Australia 382; Gabon 42.
Oxides and dioxides		10,441	15,796	30	South Africa 6,272; Australia 4,267; China 3,990.
Metal, including alloys, all forms		83,338	84,278	477	China 75,808; South Africa 7,846; United Kingdom 142.
Mercury		3	3	(2)	Mainly from Spain.
Molybdenum:					
Ore and concentrate:					
Roasted		35,462 r	265,749	14,611	Chile 142,217; Mexico 41,840; Canada 23,875.
Unroasted		110	117	112	Mainly from Australia.
Oxides and hydroxides		2,473	1,281	241	Uzbekistan 410; Chile 394; Netherlands 150.
Metal, including alloys, all forms		1,887	2,155	511	China 537; Germany 440; Austria 418.
Nickel:					
Ore and concentrate	thousand metric tons	4,513	4,757	--	Indonesia 2,218; New Caldonia 1,160; Philippines 1,379.
Matte		128,599	114,052	--	Indonesia 94,295; Australia 12,644; Philippines 6,857.
Oxides and hydroxides		258	130	11	Canada 81; Finland 37; China 1.
Metal, including alloys:					
Scrap		9,434	7,054	1,829	Russia 1,327; Republic of Korea 1,226; Other 642.
Unwrought		52,562	50,404	24	Norway 7,579; Russia 7,295; South Africa 7,057.
Semimanufactures		12,782	12,390	1,326	United Kingdom 4,525; Canada 4,336; Germany 582.
Platinum-group metals, including alloys, unwrought and partly wrought:					
Palladium	value, thousands	$482	$439	$61	South Africa $168; Russia $120; Germany $36.
Platinum	do.	$1,712	$1,774	$110	South Africa $1,393; Germany $78; Russia $67.
Rhodium	do.	$224	$577	$51	South Africa $392; United Kingdom $44; Russia $42.
Iridium, osmium, ruthenium	do.	$31	$36	$2	South Africa $29; Russia $1; United Kingdom $1.
Rare-earth metals, including alloys, all forms		6,379	8,387	(2)	China 8,384; Estonia 1.
Selenium		13	13	--	Philippines 10; Australia 1; Belgium 1.
Silicon, high-purity		10,981	13,003	7,631	United Kingdom 1,873; Germany 1,688; China 1,161.
Silver:					
Ore and concentrate		13,202	7,488	--	Chile 5,279; Peru 2,206; Republic of Korea 3.
Metal including alloys, unwrought and partly wrought		2,664	3,391	2,046	Republic of Korea 510; Mexico 260; Australia 221.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Sources, 2005: United States	Sources, 2005: Other, principal
METALS--Continued					
Tin, metal, including alloys:					
Scrap		128	266	--	Republic of Korea 152; Philippines 52; Thailand 32.
Unwrought		33,078	34,204	40	Indonesia 16,158; China 10,649; Malaysia 3,718.
Semimanufactures		1,386	1,493	3	Thailand 1,366; Malaysia 70; Republic of Korea 37.
Titanium:					
Ore and concentrate		450,287	509,797	--	Vietnam 156,352; Australia 148,145; India 66.
Oxides		15,211	13,091	66	China 6,435; Republic of Korea 4,326; France 617.
Metal, including alloys, all forms		6,940 r	5,948	1,702	Kazakhstan 1,485; Russia 1,408; Ukraine 345.
Tungsten:					
Ore and concentrate		134	3	--	All from Canada.
Metal, including alloys, all forms		1,474	2,222	558	China 1,183; Republic of Korea 224; Australia 66.
Uranium and thorium:					
Ore and concentrate		33	27	--	Malaysia 20; India 7.
Metal, including alloys, all forms		302	490	4	Canada 477; France 9.
Vanadium:					
Oxides and hydroxides		2,274	2,713	(2)	China 2,383; South Africa 290; Australia 40.
Metal, including alloys, all forms		316	288	187	Germany 100; China 1.
Zinc:					
Ore and concentrate	thousand metric tons	1,125	1,044	153	Australia 374; Peru 171; Bolivia 114.
Oxides		19,097	17,009	259	China 9,026; Republic of Korea 5,012; India 1,197.
Blue powder		2,231	3,298	--	China 1,537; Republic of Korea 1,326.
Ash and residue containing zinc		34,159	32,149	4,459	Republic of Korea 4,634; Iran 3,039; Other 13,484.
Metal, including alloys:					
Scrap		97	377	298	Philippines 51; Thailand 28.
Unwrought		44,386	48,547	20	Peru 18,580; China 13,177; Namibia 10,181.
Semimanufactures		11,302 r	12,251	12,251	China 7,861; Republic of Korea 2,020; Malaysia 633.
Zirconium:					
Ore and concentrate		67,915	78,020	1,732	Australia 47,318; South Africa 22,914; Russia 3,666.
Metal, including alloys, all forms		553	712	280	France 225; Australia 151; Republic of Korea 21.
INDUSTRIAL MINERALS					
Abrasives (not elsewhere specified):					
Natural, corundum, emery, pumice, etc.		14,937	14,995	662	India 7,488; China 5,234; Turkey 942.
Artificial:					
Corundum		172,958	155,586	346	China 121,992; Austria 10,078; Czech Republic 580.
Silicon carbide		86,141	94,532	257	China 88,941; Norway 1,975; Brazil 1,672.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$3,499	$3,671	$3,544	China 32; Brazil 30; Switzerland 27.
Grinding and polishing wheels and stones		7,971	8,238	142	China 4,030; Thailand 3,184; Republic of Korea 204.
Asbestos, crude	value, thousands	$3,663	$101	--	Zimbabwe $81; Canada $15.
Barite and witherite		51,276	75,852	54	Mainly from China.
Boron:					
Crude natural borates		40,994	28,084	--	Mainly from Turkey.
Oxides and acids		50,568	54,721	22,518	Russia 25,144; Turkey 5,240; Chile 910.
Cement		841,114	951,328	420	Republic of Korea 873,805; China 57,595; France 17,522.
Chalk		1	114	--	All from Republic of Korea.
Clays, crude:					
Bentonite		215,815	203,749	159,034	China 42,340; New Zealand 854; United Kingdom 439.
Chamotte or dinas earth		12,234	11,543	--	Mainly from China.
Fire clay		6,056	3,333	1,464	Mainly from China.
Fuller's earth		11,063	12,857	4,902	Mainly from China.
Kaolin	thousand metric tons	1,275	1,276	827	Brazil 261; China 107; Indonesia 28.
Unspecified		158,729	148,362	6,019	China 128,549; South Africa 10,238; India 1,040.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	Sources, 2005	
				United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Diamond, natural:					
Gem, not set or strung	value, thousands	$1,154,675	$1,169,431	$51,946	India $478,856; Belgium $258,675; Botswana $21,644.
Industrial stones	do.	$10,086	$12,928	$2,307	Botswana $5,718; Belgium $1,766; United Kingdom $1,722.
Dust and powder	do.	$52,286	$44,650	$9,163	Ireland $21,377; China $4,430; Republic of Korea $3,794.
Diatomite and other infusorial earth		6,714	6,980	5,050	China 1,821; Mexico 36.
Feldspar		18,312	18,733	--	Republic of Korea 15,919; India 1,343; China 464.
Fluorspar	value, thousands	$61,198 r	$67,856	--	China $48,215; Mexico $18,277; Mongolia $366.
Fertilizer materials:					
Crude (note elsewhere specified)		32,756	34,025	9	China 16,066; Indonesia 12,070; Philippines 1,251.
Manufactured:					
Ammonia		234,459	215,619	(2)	Indonesia 187,530; Republic of Korea 28,020; Singapore 41.
Phosphatic		171,958	166,663	49,058	China 108,267; Republic of Korea 9,298.
Potassic		961,052	903,493	141,614	Canada 500,102; Russia 89,753; China 47,711.
Graphite, natural		178,112	171,110	402	China 166,001; Republic of Korea 2,137; Sri Lanka 1,300.
Gypsum and plaster	thousand metric tons	1,994	1,960	(2)	Australia 976; Thailand 975; Morocco 4.
Iodine		509	545	10	Mainly from Chile.
Lime		4,723	3,091	195	China 2,680; Indonesia 100; France 41.
Kyanite and related materials, mullite and unspecified		27,767	29,609	4,151	South Africa 10,229; China 3,784; Hungary 1,006.
Magnesium compounds:					
Magnesite, crude		7,107	6,847	--	China 6,600; Australia 200.
Oxides and hydroxides		611,479	578,228	435	China 547,493; Republic of Korea 15,991.
Other		3,289	5,679	--	Mainly from Germany.
Mica:					
Crude including splittings and waste		61,277	61,566	564	China 45,006; India 7,016; Canada 4,156.
Worked including agglomerated splittings		153	201	63	Belgium 35; United Kingdom 30; India 15.
Nitrates, crude		17,557	25,889	19	Mainly from Chile.
Phosphates, crude		820,572	774,297	--	China 387,333; Jordan 149,420; Morocco 111,930.
Phosphorus		31,602	31,481	--	China 30,906; Netherlands 482; Vietnam 50.
Pigments, mineral, iron oxides and hydroxides processed		23,244	20,078	327	China 11,674; Germany 4,766; Republic of Korea 1,216.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$153,431	$154,974	$5,504	Thailand $48,666; Hong Kong $34,855; Australia $10,493.
Synthetic	do.	$21,516	$20,568	$9,755	China $2,771; Russia $3,132.
Pyrite, unroasted		9,951	33,823	--	China 28,233; Indonesia 5,590.
Quartz crystal, piezoelectric	value, thousands	$20,943	$15,899	$3,786	China $7,008; Thailand $3,483; Russia $610.
Salt and brine	thousand metric tons	8,066	8,302	3	Mexico 3,584; Australia 3,998; India 410.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	do.	105	88	6	China 23; India 12; Portugal 5.
Worked	do.	1,498	1,548	1	China 1,430; Italy 24; India 14.
Dolomite, chiefly refractory-grade	thousand metric tons	2,347	2,446	(2)	China 1,361; Philippines 565; Thailand 492.
Gravel and crushed rock		246,363	239,715	803	China 108,448; Philippines 28,820; Other 68,463.
Limestone other than dimension	thousand metric tons	340	294	1	Vietnam 135; Malaysia 98; China 38.
Quartz and quartzite		163,408	154,572	4,559	India 53,253; Republic of Korea 54,128; China 28,566.
Sand other than metal-bearing and sand and gravel	thousand metric tons	6,307	6,313	15	China 4,406; Australia 1,380; Other 284.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2004	2005	Sources, 2005	
			United States	Other, principal
INDUSTRIAL MINERALS--Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	1,672	1,626	--	Republic of Korea 1,052; China 574.
Colloidal, precipitated, sublimed	1,236	1,102	6	Republic of Korea 1,039; France 50.
Sulfuric acid	8,191 r	181	--	Mainly from Other.
Talc, steatite, soapstone, pyrophyllite	300,924	308,388	4,146	China 271,383; Australia 26,023.
Vermiculite, perlite, chlorite	230,772	264,775	301	China 244,806; South Africa.
Other; slag and dross, not metal-bearing	492,862	734,690	1,931	Republic of Korea 235,262; Canada 36,011; Other 09,078.

rRevised. -- Zero.
[1]Data presented in this table are from United Nations, Department of Economic and Social Affairs, Statistics Division.
[2]Less than 1/2 unit.