The Mineral Industry of Japan

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Japan is located in East Asia between the North Pacific Ocean and the Sea of Japan (East Sea), east of the Korean Peninsula. The country's total area is 377,835 square kilometers, and its population as of October 1, 2004, was estimated to be 127.7 million. Japan was one of the most highly industrialized and technologically advanced countries in the world. Its economy ranked second in the world with a gross domestic product (GDP) of $4.7 trillion ($3.8 trillion based on purchasing power parity); its per capita GDP was $36,574 ($29,906 based on purchasing power parity) in 2004 (International Monetary Fund, 2005§[1]; Ministry of Internal Affairs and Communications, 2005§).

Japan has limited indigenous mineral resources and relied heavily on imports of mineral fuels and a wide variety of nonfuel 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 mineral resources of such industrial minerals as dolomite, iodine, limestone, pyrophyllite, and silica (table 3).

The production capacities of Japan's chemical, construction material, electricity, and ferrous and nonferrous metals industries in the manufacturing and utility sectors were among the largest in the world. These industries in the manufacturing sector 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 downstream industries in the manufacturing and construction sectors and for export to the world markets. The electricity and gas industries used imported coal, natural gas, petroleum, and uranium and other nuclear fuel materials to produce electricity and processed natural gas to meet the energy requirements for the construction, manufacturing, mining, and other sectors of the economy.

In 2004, 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, phosphate rock, potash, rare earths, industrial salt, silicon metal, silver metal, tungsten ore, tin metal, zinc ore and metal, and zircon. Japan was one of the world's major exporters of cement, refined copper, inorganic chemicals, compound fertilizers, iodine, electrolytic manganese dioxide (EMD), high-purity rare (minor) metals, iron and steel, and titanium sponge metal and titanium mill 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 the GDP at constant prices classified by economic activities of Japan's national accounts, the percentage contribution of the mining sector to Japan's GDP was only 0.2% in 2003 (the latest year for which data were available). The percentage contribution to Japan's GDP by the mineral industry, which included processing industries of chemicals (2.0%), petroleum and coal products (1.1%), iron and steel (1.0%), fabricated metal products (0.9%), industrial mineral products (0.7%), and nonferrous metals (0.4%), and the mining (0.2%) industry, however, was 6.3% (Economic and Social Research Institute, 2005b§).

The mineral industry was important to the Japanese economy because of its contribution to the GDP and the vital role it played in supplying primary materials not only to its own construction and manufacturing sectors, but also to those in China, the Republic of Korea, and Taiwan in northeast Asia and to such members of the Association of Southeast Asian Nations (ASEAN) as Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

The Japanese economy, as measured by real GDP in 2000 constant prices, grew by 1.9% in fiscal year 2004 (from April 2004 to March 2005) following a positive growth of 2.0% (revised) in fiscal year 2003. Japan's real GDP growth in calendar year 2004 was estimated to be 2.7% compared with 1.4% in calendar year 2003. The higher growth in 2004 was largely owing to a 2.6% growth in private demand as a result of increased private nonresidential (plant and equipment) investment and increased exports of goods and services (Economic and Social Research Institute, 2005a§).

In 2004, Japan's industrial production, as measured by the indices of mining and manufacturing, increased by 5.6% compared with 3.3% in 2003. The number of unemployed workers in Japan decreased to 3.2 million from 3.5 million in 2003, and the total labor force decreased to 66.4 million from 66.67 million in 2003. As a result, the unemployment rate in Japan decreased to 4.7% from 5.3% in 2003. Japan's merchandise trade surplus rose to $110.5 billion from $87.9 billion in 2003. The Japanese yen appreciated by 7.2% to ¥108.17 against $1.00 in 2004. As measured by the consumer price index, Japan's rate of change in the consumer price index was unchanged in 2003 compared with the rate of deflation of 0.3% in 2003 (Japan Institute for Labor Policy and Training, 2005§).

Government Policies and Programs

To secure stable and efficient supply of mineral resources, Japan promoted exploration and development of minerals overseas and encouraged domestic metals recycling.

The Metal Mining Agency of Japan (MMAJ) and the state-owned Japan National Oil Corp. (JNOC) merged in February 2004.

As a result, the new Government organization under the supervision of the Ministry of Economy, Trade, and Industry (METI), which is called Japan Oil, Gas and Metals National Corp. (JOGMEC), was established with the objective of securing a stable supply of oil, gas, and nonferrous metals to Japan. To achieve this objective, JOGMEC would provide 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; would assume responsibility for the management of the national stockpile of crude oil, liquefied petroleum gas (LPG), and rare metals; and would support activities to control mine pollution. According to JOGMEC, the 2004 budget for metals-related activities (excluding oil and gas) totaled about $75 million with a staff of about 200 professionals; 35 of those were geologists. JOGMEC's metals-related activities included providing mineral resources information services, conducting domestic and overseas geologic surveys, financing domestic and overseas mineral exploration and development projects, supporting technology development projects, stockpiling rare metals (chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium), conducting mine pollution control activities, and cooperating with developing countries on economic growth (Japan Oil, Gas and Metals National Corp., 2004).

To contribute to a stable supply of mineral resources to Japan and to accelerate mineral production and economic growth in developing countries, the former MMAJ started a new mineral exploration program, which is called the Joint Basic Exploration Scheme (JBES), with a $5 million budget in fiscal year 2003. JOGMEC continued the JBES program and increased its annual budget to $8 million in fiscal year 2004 and was expected to increase its annual budget to $11 million in fiscal year 2005. According to JOGMEC, the overseas mineral exploration projects implemented by the former MMAJ as part of the Development Assistance Program were completed in 2004 (Japan Oil, Gas and Metals National Corp., 2005a).

The JBES-targeted commodities were, in order of priority, copper, zinc, nickel, platinum-group metals, and rare metals, which included cobalt, chromium, manganese, rare earths, tantalum, titanium, and tungsten. The potential joint-venture partners of the JBES included state-owned mineral enterprises; regional government organizations; local geological survey agencies; and private, multinational major, 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 minimum work and expenditure commitment and farm-in arrangements for projects that are intended to last from 1 to 5 years. Regarding JOGMEC's interest acquired through the joint-venture exploration, JOGMEC and its partner need to agree to a condition that JOGMEC may transfer its interest to a proper successor after completion of the project period. As of 2004, JOGMEC's ongoing 10 JBES projects included 2 in Argentina to explore for copper; 2 in Brazil, for copper and nickel; 2 in Chile, for copper; 2 in Indonesia, for copper and zinc; and 2 in Mongolia, for copper. According to JOGMEC, one project in Mexico was still under negotiation in 2004, and most of the ongoing projects were joint ventures with private mining companies. JOGMEC's JBES budget originated from the METI; a typical annual budget for a JBES project was between $100,000 and $1 million. Operation and management of each JBES project budget must conform to the Japanese fiscal year (Japan Oil, Gas and Metals National Corp., 2004).

Environmental Issues

Japan stopped mining asbestos in 2002. A total ban on asbestos was announced in 2002 following many years of sporadic and variably effective measures intended to control its use. Asbestos-related illness made headlines in 1982 when a local press published a hospital study which concluded that about one-third of 848 deaths over 5 years in Yokosuka in Kanagawa Prefecture were caused by asbestos-related lung cancer. Yokosuka has long been the site of a U.S. naval base and the shipbuilding industry. Following the discovery that asbestos from a decommissioned U.S. Navy ship had been dumped by a roadside, public awareness grew and made asbestos a major issue of concern across Japan (Furuya, Natori, and Ikeda, 2003).

To response to the situation, the Ministry of Health, Labor and Welfare announced in June 2002 that the Government would introduce a total ban on chrysotile asbestos. As to when and how the ban would be implemented was not determined. In 2003, a report of the Technical Committee on Substitute for Asbestos was released followed by the hearing from the Asbestos Institute and Canadian Government (Canada was a major asbestos supplier to Japan) and the public comments on the ban. After the deliberation of the Labor Policy Council in September 2003, the amended Enforcement Order of Industrial Safety and Health Law (ISHL) was proclaimed in October 2003 and was enforced beginning on October 1, 2004. According to the Amended ISHL of 2003, the manufacture, import, use, and transfer of the 10 main products that contain greater than 1% asbestos, by weight, were prohibited. These 10 products were adhesives, asbestos cement pipes, brake linings, brake pads, clutch facings, clutch lining, decorated cement shingles for dwelling roofs, extruded cement panels, fiber-reinforced boards, and fiber-reinforced cement sidings. According to the Amended Order, all other asbestos products were not prohibited. All other asbestos products included the 10 prohibited products, provided they contain 1% or less asbestos by weight or were produced or imported before October 1, 2004, and asbestos fiber (Kazuko, 2004§).

Production

Mine production of all nonferrous metals (except zinc) and most industrial minerals (except bentonite, dolomite, gypsum, iodine, and kaolin) declined in 2004 because of depleting ore reserves. Mine production of zinc increased because of higher ore production from the Toyoha Mine in Hokkaido Prefecture. Limestone production declined mainly because of decreased consumption for the manufacturing of cement and construction aggregate and for road construction. Japan's coal output remained at about the same level as that of 2003. In 2004, 11 small-scale open pit coal mines and 1 major underground coal mine operated in the Prefectures of Hokkaido and Yamaguchi.

The output of crude petroleum and natural gas continued to increase in 2004 but remained insignificant when compared with Japan's requirements.

In the mineral-processing industry, production of most nonferrous metals, such as refined copper, gold, lead, nickel, tin, titanium, and zinc, increased owing to the continued economic growth and higher demand for metals in the domestic and Asian markets in 2004. Production of crude steel reached the highest level since 1974 owing mainly to the stronger domestic demand for automobiles, machinery and equipment, and shipbuilding industries and the continued high level of exports to China, the Republic of Korea, Taiwan, and Thailand. Production of titanium sponge metal increased sharply in 2004 mainly owing to increased domestic demand and increased exports to the European Union (EU). Production of cement and other construction-related materials was slightly lower because of the continued cutbacks in public works projects in 2004. Production of refined petroleum products was mostly lower in 2004 because of decreased domestic demand for kerosene, LPG, and residual fuel oil (table 1).

Trade

Japan remained a net importer of minerals mainly owing to its large imports of mineral fuels. Japan's mineral trade deficit increased to $98.6 billion in 2004 from $78.8 billion in 2003 as a result of a 22.7% increase in import bills for mineral fuels and increases in import bills for all other minerals and mineral products and despite higher export earnings from iron and steel products and all other minerals and mineral products in 2004 (table 4).

Total imports of minerals increased by 26.4% to $148.3 billion and accounted for 32.6% of the total imports, which were valued at $454.9 billion in 2004. The higher import bill for minerals was a combination of higher import volume and price. Of the total minerals imports, $99.4 billion was for such mineral fuels as coal, LNG, crude petroleum, partially refined petroleum, refined petroleum products, and other mineral fuels; $10.2 billion, for ores and concentrates of iron and steel and nonferrous metals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and $1.4 billion, 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 $37.3 billion, of which $20.8 billion was for products of iron and steel and nonferrous, rare, and other base metals; $7.7 billion, for precious and semiprecious stones and precious metals; $5.0 billion, for mineral-related chemicals and fertilizers; and $3.8 billion, for articles and products of asbestos, cement, ceramics, glass, mica, and stone (Ministry of Finance, 2004b, p. 9-13, 15-16, 34-41).

Total exports of minerals, mineral-related chemicals, and processed mineral products increased by 29.1% to $49.7 billion and accounted for 8.8% of Japan's total exports, which were valued at $565.3 billion in 2004. Exports of iron and steel products and nonferrous, rare, and other base metals totaled $35.9 billion. Exports of processed mineral articles and products of asbestos, cement, ceramics, glass, mica, and stone amounted to $5.8 billion. Exports of cement, earths and stone, mineral fuels, lime, ferrous and nonferrous metal ores, plastering materials, salt, and sulfur were $2.8 billion. Exports of mineral-related chemicals and fertilizer were $2.8 billion. Exports of precious and semiprecious stones and precious metals were $2.5 billion (Ministry of Finance, 2004a, 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 2004. The major industrial mineral mines (mostly limestone quarries) totaled about 40 in 2004. The coal mining sector consisted of nine small-scale open pit mines and one major underground mine (Kushiro) in Hokkaido Prefecture and one small-scale open pit coal mine at Mine, Yamaguchi Prefecture on Honshu.

Japan's mining capacity of nonferrous and precious metals (mainly gold, lead, silver, and zinc) and coal decreased substantially during the year. The number of persons employed by the mining sector dropped to 40,000 in 2004 from 50,000 in 2003 (Statistical Handbook of Japan, 2005§).

In the mineral-processing sector, the iron and steel industry continued to cut the number of employees to 154,578 from 155,325 at the end of 2003. The industry's production capacity of pig iron decreased to 82.00 million metric tons per year (Mt/yr) from 84.38 Mt/yr in 2003, but the production capacity of crude steel increased slightly to 120.79 Mt/yr from 120.53 Mt/yr at the end of 2003. In the nonferrous metals industry, which included smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, the number of regular employees was reduced to 5,148 from 5,572 at the end of 2003. In 2004, Japan's production capacity of refined copper remained at 1.5 Mt/yr; refined gold increased to 186.0 metric tons per year (t/yr) from 182.4 t/yr at the end of 2003; refined lead remained at 275,000 t/yr; refined silver decreased to 2,800 t/yr from 2,980 t/yr at the end of 2003; and refined zinc remained at 750,000 t/yr. Because of the strong demand for titanium sponge metal in late 2004, Toho Titanium Co. Ltd. announced in November 2004 that its capacity would be increased by 7.7% to 14,000 t/yr by February 2005 (Yahoo.com, 2004§). Japan's cement industry cut the number of its regular employees by 311 to 3,349 and reduced its cement clinker capacity by 6.5% to 76.0 Mt/yr from 81.4 Mt/yr at the end of 2004 (Ministry of Economy, Trade and Industry, 2004a, p. 143, 145; 2004c, p. 107-108, 160, 162).

Commodity Review

Metals

Aluminum and Bauxite and Alumina.—Japan relied 100% on imports of bauxite for the production of alumina and

aluminum hydroxide. In 2004, imports of bauxite decreased by 3% to 1.95 million metric tons (Mt) valued at $70.8 million. The major supplying countries of bauxite in 2004 were Australia (53.5%), Indonesia (35.5%), and India (8.2%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture with a capacity to produce 365,000 t/yr of aluminum hydroxide and 163,000 t/yr of alumina, Showa Denko K.K. at its Yokohama plant in Kanagawa Prefecture with a 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 with a 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 was insignificant. Virtually all Japan's requirements for primary aluminum were met by imports. In 2004, imports of primary aluminum increased by 2.7% to more than 3 Mt valued at $5.25 billion, of which 2.05 Mt was ingot and 971,488 metric tons (t), alloys (Ministry of Finance, 2004b, p. 668-669).

Of the total primary aluminum imports, about 45% was supplied from Japan's 11 overseas aluminum smelter projects; Japanese aluminum and major trading companies held substantial equity shares in those smelters in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, the United States, and Venezuela (table 5). In 2004, Japan diversified its import sources of primary aluminum and aluminum alloy into 52 countries worldwide. Among the 52 countries, the major suppliers were Russia (25.6%), Australia (18.3%), China (10.7%), New Zealand (7.5%), Brazil (7.1%), South Africa (6.9%), Canada (5.3%), Indonesia (4.6%), and Venezuela (2.4%). The United States supplied only 6,913 t and accounted for only 0.2% of Japan's imports of primary aluminum and aluminum alloys in 2004 (Ministry of Finance, 2004b, p. 668-669).

Consumption of primary aluminum was estimated to be 2 Mt in 2004 of which about 1.8 Mt was for aluminum rolled products. Exports of primary aluminum, which included aluminum ingots (18,923 t) and aluminum alloys (17,379 t), totaled 36,302 t valued at $82.5 million in 2004. The major buyers of aluminum ingot were Thailand (83.3%), China (8.1%), Vietnam (3.0%), and the Philippines (2.5%). The major buyers of aluminum alloys were the Republic of Korea (34.0%), Indonesia (12.1%), Thailand (11.2%), and China (10.4%) (Ministry of Finance, 2004a, p. 577-578).

Overall demand for aluminum mill products was estimated to be about 4.1 Mt in 2004. According to the Japan Aluminum Association, demand for aluminum mill products by end-use market in 2004 was 38.3% for transportation, 17.4% for building and construction, 12.9% for fabricated metal, 11.4% for food, 4.3% for communication machinery, 4.2% for industrial machinery, and 11.5% for others (Japan Aluminum Association, 2005§).

Cadmium.—In 2004, Japan was the world's second ranked producer after the Republic of Korea and the world's leading consumer of cadmium. Cadmium was produced mainly as a byproduct of zinc-refining operations that used mostly ore imported from Australia, Canada, Peru, and the United States. In 2004, cadmium was produced by Toho Zinc Co. Ltd. (667 t); Zinc Excel Co. Ltd. (561 t), which was a joint-venture company of Dowa Mining Co. Ltd. and Mitsubishi Materials Corp.; Sumitomo Metal Mining Co. Ltd. (451 t); Nippon Mining & Metals Co. Ltd. (256 t); and Mitsui Mining & Smelting Co. Ltd. (225 t) (Arumu Publishing Co. Ltd., 2005, p. 110).

Because of a 31% decrease in overall consumption of cadmium, production of cadmium dropped by 11% in 2004. Imports of cadmium ingot and powder also decreased by 31.3% to 2,626 t valued at $3.5 million. The major suppliers were the Republic of Korea (35.8%), Canada (19.2%), Peru (14.2%), Germany (10.7%), Russia (6.5%), and China (5.0%) (Ministry of Finance, 2004b, p. 676).

In 2004, demand for domestically produced cadmium decreased by 2.7% to 2,441 t, of which 2,363 t was consumed for the production of nickel-cadmium batteries; 35 t, for the production of alloys; 4 t, for the production of pigments; 1 t, for plating; and 38 t, for other end uses (Japan Mining Industry Association, 2005, p. 112).

Chromium.—Japan relied on imports to meet all chromite ore and concentrate requirements for its iron and steel industry. Japan's imports of chromite ore and concentrate increased by 46.6% to 271,284 t valued at $42.5 million in 2004. The major suppliers were India (59.5%), South Africa (25.3%), the Philippines (4.8%), and Turkey (3.9%) (Ministry of Finance, 2004b, p. 170).

Domestically produced ferrochromium decreased by 30.7% to about 13,500 t in 2004 owing to the temporary shutdown of JFE Steel Corp.'s East Japan Refinery in Chiba Prefecture because of environmental problems and increased imports of high-carbon ferrochromium. In 2004, imports of ferrochromium increased by 7.0% to 977,000 t valued at $745.5 million owing to increased demand by stainless steel producers. The major overseas suppliers of ferrochromium were South Africa (53.7%), Kazakhstan (23.8%), Zimbabwe (7.2%), India (6.1%), China (5.0%), and Russia (3.5%) (Ministry of Finance, 2004b, p. 628).

Consumption of ferrochromium increased by 1.6% to 908,300 t, of which 864,200 t was high-carbon ferrochromium and 44,000 t, low-carbon ferrochromium (Ministry of Economy, Trade and Industry, 2004c, p. 216). Exports of ferrochromium totaled 2,597 t valued at $6.0 million, of which 2,556 t was low-carbon ferrochromium and 41 t, high-carbon ferrochromium. The major buyers of ferrochromium were the United States (79.3%), Thailand (13.0%), and India (4.6%) (Ministry of Finance, 2004a, p. 500).

Ferrochromium is one of the seven rare metals stockpiled under the National Stockpile Program, which was managed by JOGMEC, and the private stockpile program, which was managed by the Japan Rare Metal Association. Ferrochromium was stockpiled in the form of nugget. As of December 2004, the National Stockpile Program had about 30.4 days' supply, or 72.3% of its target (Japan Oil, Gas and Metals National Corporation, 2005b).

Production of chromium metal was by JFE Materials (formerly NKK Materials), which operated a 1,000-t/yr plant that used the silicothermic method at Shinminato in Toyama Prefecture, and by Nippon Denko Co. Ltd., which operated an

800-t/yr plant that used the aluminothermic reduction method at Oshima and was located a few kilometers south of Shinminato in Toyama Prefecture. In 2004, JPE Materials was estimated to produce 1,000 t of chromium metal, and Nippon Denko produced about 600 t and was expected to produce 700 t in 2005. In Japan, chromium metal was consumed mainly in the manufacture of supperalloys, heat-resisting steel, and electronic materials. In 2004, Japan imported 3,682 t of chromium ingot and powder, which was worth $29 million, to meet its demand for chromium metal. The major suppliers were China (1,836 t), the United States (632 t), France (496 t), Russia (329 t), and the United Kingdom (308 t) (Arumu Publishing Co. Ltd., 2005, p. 102).

Cobalt.—Japan relied 100% on imported cobalt matte and other intermediate products of cobalt for metal production. Sumitomo Metal Mining Co. Ltd., which was Japan's sole producer of cobalt metal and cobalt salts (cobalt sulfate and cobalt oxide), operated a cobalt refinery in Niihama, Ehime Prefecture, with the capacity of 600 t/yr (Arumu Publishing Co. Ltd., 2005, p. 75). Japan also imported cobalt hydroxide, metal, oxide, and powder to meet its cobalt requirements.

In 2004, imports of cobalt matte, other intermediate products of cobalt, cobalt ingot, and powder totaled 14,715 t valued at $716.7 million. The major suppliers were Finland (26.7%), Australia (22.8%), Canada (15.7%), Zambia (11.6%), Norway (8.2%), and Belgium (3.9%). Japan also imported 2,108 t of cobalt oxide and 518 t of cobalt hydroxide. Belgium and Finland were the two principal suppliers of cobalt oxides and accounted for 66.6% and 20.9%, respectively. Belgium and Finland were also the two principal suppliers of cobalt hydroxide and accounted for 40.1% and 25.7%, respectively. Import bills of cobalt oxide and hydroxide totaled $104.2 million (Ministry of Finance, 2004b, p. 182, 676).

In 2004, demand for cobalt metal decreased by 3.3% to 3,425.6 t, of which 873 t was for specialty steel; 489 t, for pipe, plate, rod, and wire; 419 t, for ultrahard tool steel (cemented carbides); 210 t, for manufacturing of magnetic materials; 254 t, for catalysts; and 1,181 t, for other end uses (Ministry of Economy, Trade and Industry, 2004c, p. 282). According to an estimate by Mitsui & Co. Ltd., the overall demand for cobalt, which included ingot, oxide, powder, and salt, was estimated to be 12,600 t in 2004 compared with 11,000 t in 2003 and 9,400 t in 2002. Demand for cobalt in lithium ion batteries started to weaken in late 2004, and battery manufacturers began reducing their inventory levels. Overall demand for cobalt was projected to decrease to 11,500 t in 2005 (Arumu Publishing Co. Ltd., 2005, p. 75, 77).

Cobalt is one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of broken cathode and crushed ingot. As of December 2004, the National Stockpile Program had 24.2 days' supply, or 57.6% of its target (Japan Oil, Gas and Metals National Corp., 2005b).

Copper, Lead, and Zinc.—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's sole lead and zinc mining company. In 2004, the mine produced about 403,000 t of crude ore, and the mill produced about 5,510 t of lead and about 47,800 t of zinc in concentrates; the mill also produced about 76 t of byproduct silver and a negligible quantity of byproduct copper in lead and zinc concentrates. In 2004, Japan relied on imported ores and concentrates for 86% of its copper smelters' raw materials requirements, 41% of its lead smelters' raw material requirements, and 77% of its zinc smelters' requirements for the production of refined copper, refined lead, and refined zinc (Japan Mining Industry Association, 2005, p. 64, 78, 91, 133; Ministry of Economy, Trade and Industry, 2004d, p. 128).

In 2004, Japan was the world's leading importer of copper concentrate and one of the world's major importers of lead and zinc concentrates. Imports of copper concentrate, in gross weight, increased by 8.5% to 4.5 Mt. The import bill of copper ore and concentrates increased to $3.8 billion from $2.4 billion in 2003. The major suppliers of copper concentrate were Chile (50.6%), Indonesia (13.9%), Australia (9.4%), Canada (7.8%), Peru (7.4%), Papua New Guinea (4.7%), and Argentina (3.7). In 2004, imports of copper ore and concentrate measured by metal content totaled more than 1.27 Mt of copper, of which 52.5% was from Chile; 14.8%, from Indonesia; 8.1%, from Australia; 7.9%, from Canada; 7.1%, Peru; 3.8%, from Papua New Guinea; and 3.0%, from Argentina (Ministry of Finance, 2004b, p. 169-70; Japan Mining Industry Association, 2005, p. 65).

In 2004, imports of lead ore and concentrate, in gross weight, decreased by 23.7% to 140,716 t. The import bill of lead ore and concentrate, however, increased to $103.2 from $71.8 million in 2003. The major suppliers of lead ore and concentrate were the United States (52.2%), Australia (26.8%), Bolivia (8.8%), and Russia (8.4%). Imports of zinc ore and concentrates, in gross weight, increased by 6.1% to 1.13 Mt and the import bill for zinc ore and concentrates increased to $342 million from $238.2 million in 2003. The major suppliers of zinc ore and concentrate were Australia (35.9%), the United States (16.7%), Peru (16.1%), Canada (8.3%), Bolivia (13.2%), and Mexico (4.9%) (Ministry of Finance, 2004b, p. 179).

To secure more captive copper concentrate from overseas nonferrous metals mines in which Japanese nonferrous metal mining companies held substantial equity and provided long-term loans, Sumitomo Metal Mining and Sumitomo Corp. jointly announced in October that they had reached an agreement in principle with Phelps Dodge Corp. of the United States and Compania de Minas Buenaventura S.A.A. of Peru to acquire an equity interest in Socidad Minera Cerro Verde S.A.A. (Cerro Verde), which operated a copper mine near Arequipa, Peru (table 9). As of October 2004, Phelps Dodge owned 82.5% of Cero Verde, and Buenaventura owned 9.2%. According to Sumitomo Metal Mining, the joint Sumitomo interests in Cero Verde could range between 21% and 25% with an investment of between $265 million and $334 million, of which Sumitomo Metal Mining and Sumitomo Corp. would hold 80% and 20%, respectively, of the joint equity in the project. The joint Sumitomo investment in the project would increase capital and raise funds for the planned $850 million sulfide ore production capacity expansion to produce up to 180,000 t/yr of copper contained in copper concentrate beginning in the fourth quarter of 2006, and Sumitomo would have the right to purchase at least the percentage (21%) of its equity interests in Cerro Verde of the copper concentrate (Sumitomo Metal Mining Co. Ltd., 2004d§).

In January 2004, Pan Pacific Copper Co. Ltd., which was a joint venture of Nippon Mining & Metals (66%) and

Mitsui Mining & Smelting (34%), reached an agreement with Philex Mining Corp. of the Philippines for a long-term loan arrangement for mine expansion to develop a deeper ore zone at its Padcal Mine, which is located about 200 kilometers (km) north of Manila, on Luzon Island (table 9). In return, Pan Pacific Copper would offtake between 50,000 and 70,000 t/yr of the copper-gold concentrate, which contains about 15,000 t/yr of copper and 2 t/yr of gold to be produced at the mine during the next 6 to 7 years of the mine life (Nippon Mining & Metals Co. Ltd., 2004§; Pan Pacific Copper Co. Ltd., 2004§).

Metal production of copper decreased in 2004 because of lower overseas demand for refined copper. Metal production of lead and zinc decreased in 2004 owing to weaker domestic and overseas demands for refined lead and zinc in 2004. Japan's capacity utilization rate of the nonferrous metals smelting and refining industry was 94.5% for copper, 84.6% for zinc, and 80.5% for lead (Ministry of Economy, Trade and Industry, 2004c, p. 110-113, 160. 268, 270, 274).

During 2004, Sumitomo Metal Mining continued to undertake its copper expansion project at the Toyo smelter and refinery complex at Saijyo, Ehime Prefecture. The copper-refining capacity would be raised to 410,000 t/yr when the expansion project is scheduled to be completed in fiscal year 2005. The planned acquisition of equity interest in Cerro Verde was part of the company's basic strategy to secure inhouse (captive) copper ore and concentrate to feed the forthcoming increase in the refined copper production capacity at the Toyo Smelter (Sumitomo Metal Mining Co., Ltd., 2004, p. 3, 15).

Imports of refined copper increased by 11.9% to 88,200 t valued at $250.9 million in 2004. The major suppliers of refined copper were Chile (60.7%), Peru (13.2%), Republic of Korea (10.6%), Zambia (5.0%), China (2.7%), Indonesia (1.8%), and Thailand (1.5%). Imports of refined lead increased by 11.7% to 10,380 t valued at about $13.9 million. The principal suppliers of refined lead were China (87.1%) and Peru (11.9%). Imports of zinc slab (refined zinc) increased by 3.0% to 42,400 t valued at about $45.8 million. The major suppliers of zinc slab were China (44.4%), Peru (33.9%), Namibia (9.7%), and Canada (8.4%) (Ministry of Finance, 2004b, p. 662, 673).

Demand for refined copper increased by 6.1% to 1.23 Mt in 2004. Demand for refined copper, by sector, was 759,000 t for wire and cable, 446,000 t for brass mill products, and 24,000 t for others (Ministry of Economy, Trade and Industry, 2004c, p. 268). Exports of refined copper decreased by 32.8% to 194,600 t valued at $566.7 million in 2004. The buyers of refined copper were Taiwan (38.4%), China (32.5%), the Republic of Korea (9.5%), Thailand (6.2%), Indonesia (4.6%), Malaysia (3.6%), the United States (3.0%), and other countries (2.2%). Exports of unrefined copper and copper anodes decreased by 21.4% to 8,120 t in 2004 valued at $28.0 million. Most unrefined copper and copper anodes was exported to China (including Hong Kong) (31.7%), Taiwan (30.8%), and the Republic of Korea (28.2%) (Ministry of Finance, 2004a, p. 569).

In 2004, the demand for refined lead decreased by 14.6% to 177,500 t, of which 134,000 t was for storage batteries; 24,500 t, for inorganic chemicals; 7,020 t, for solder; 2,860 t, for lead pipe and sheet; and 9,120 t, for other uses (Ministry of Economy, Trade and Industry, 2004c, p. 270). Exports of refined lead decreased by 65.0% to 2,827 t valued at $2.4 million. The major buyers of refined lead were China (including Hong Kong) (57.2%), Thailand (13.3%), Malaysia (9.2%), and Taiwan (5.7%) (Ministry of Finance, 2004a, p. 583).

Demand for zinc slab decreased by 1.8% to 476,000 t, of which 229,000 t was for sheet galvanizing; 83,300 t, for other plating; 66,100 t, for brass mill products; 48,000 t, for die-cast alloy; 28,100 t, for inorganic chemicals; and 21,500 t, for other uses (Ministry of Economy, Trade and Industry, 2004c, p. 274). Exports of zinc slab decreased by 3.6% to 61,655 t valued at $65.8 million. The major buyers were Taiwan (32.2%), Indonesia (26.7%), the Philippines (16.8%), Vietnam (15.7%), Malaysia (4.2%), Thailand (1.6%), and Cambodia (1.5%) (Ministry of Finance, 2004a, p. 583-584).

Gold and Silver.—Mine production of gold was mainly by Sumitomo Metal Mining 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 and averaged 40.7 grams per metric ton (g/t) gold, or about 7.5 t of gold in 2004 (Japan Mining Industry Association, 2005, p. 133). 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. Overall mine production of gold and silver was about 8,000 kilograms (kg) and 76,000 kg, respectively (Ministry of Economy, Trade and Industry, 2004d, p. 128).

In May 2004, Sumitomo Metal Mining and its partners Sumitomo Corp. and Teck Cominco Ltd. of Canada completed and approved the final feasibility study for the Pogo gold project in Alaska. All the necessary development permits reportedly had been received, and full-scale construction started after a National Pollutant Discharge Elimination System permit was granted by the U.S. Environmental Protection Agency on May 7, 2004. The total capital cost was estimated to be $280 million, and the target date for the initial operations was scheduled to begin in March 2006, which was about 4 months behind the original target date of December 2005. According to the final feasibility study, the total resources were estimated to be 152 t of gold, and average annual production of gold was estimated to be 12 t at full capacity with 10 years of mine life. The Pogo joint-venture project, which is located about 145 km southeast of Fairbanks, Alaska, was 51% owned by Sumitomo Metal Mining America Inc. (a wholly owned subsidiary of Sumitomo Metal Mining); 40%, by Teck Cominco, the project operator; and 9%, by SC Minerals America, Inc. (a wholly owned subsidiary of Sumitomo Corp.) (Mining Journal, 2004; Sumitomo Metal Mining Co. Ltd., 2004b§).

In 2004, metal production of primary gold and silver decreased by 15.4% and 10.0%, respectively, owing mainly to reduced raw materials inputs at the gold and silver refineries. Imports of gold (ingot and powder) increased by 63.4% to 70,400 kg valued at $912 million. The major suppliers of gold ingot and powder were Switzerland (44.8%), Australia (15.3), Hong Kong (12.0%), the United States (11.8%), Uzbekistan (7.6%), the Republic of Korea (2.7%), Belgium (2.1%), and South Africa (1.8%). Imports of silver (ingot and powder)

increased by 35.4% to 1,715 t valued at $273 million. The major suppliers of silver ingot and powder were Peru (24.2%), Mexico (24.1%), the Republic of Korea (20.4%), Australia (15.1%), the United States (5.9%), China (4.6%), and Russia (2.1%) (Ministry of Finance, 2004b, p. 621-622).

In 2004, the demand for gold, which included dental and medical, electrical and electronic, industrial arts and crafts, jewelry, and private investment, increased slightly to 290,000 kg from 288,000 kg in 2003. The demand for gold by end user was for dental and medical, which decreased to about 21,400 kg from about 22,400 kg in 2003; electrical, electronic, and communication apparatus, increased to about 86,300 kg from 85,100 kg; private hoarding, increased to 80,500 kg from 79,500 kg; gold plating, increased to 23,600 kg from 23,500 kg; jewelry, decreased to 20,200 from 20,500 kg; industrial arts and crafts, decreased to 4,650 kg from 4,880 kg; pottery and porcelain, decreased to 1,420 kg from 1,530 kg; decorations and badges, decreased to 1,410 kg from 1,500 kg; and other uses, remained unchanged at about 48,100 kg (table 6). Among the end users, demand for jewelry reached another new low at 20,200 kg in 2004 (Arumu Publishing Co. Ltd., 2005, p. 115).

In 2004, demand for silver decreased by 3.0% to 2,600 t. Demand for silver by end user was for silver nitrate for photography and other uses, 1,240 t, and 307 t, respectively; electrical contacts, 260 t; rolled products, 248 t; brazing alloy (silver solder), 105 t; and other uses, 434 t (table 6). The substantial decline in silver nitrate demand for photography was offset by increased demand for silver nitrate for other uses and for electrical contacts (Ministry of Economy, Trade and Industry 2004c, p. 288).

Exports of gold ingot and powder decreased by 50.4% to 11,250 kg in 2004 valued at $144.8 million. The major buyers of refined gold ingot and powder were the United Kingdom (63.3%), Hong Kong (9.9%), the United Arab Emirates (7.2%), the Republic of Korea (6.9%), Taiwan (4.1%), Singapore (3.0%), and Vietnam (2.7%). Exports of silver ingot and powder increased by 36.6% to 601.6 t in 2004 valued at $47.3 million. The major buyers of refined silver and powder were Singapore (20.7%), China (20.2%), Taiwan (15.6%), the Republic of Korea (15.0%), Hong Kong (12.9%), the United States (4.9%), the United Kingdom (3.9%), and Malaysia (3.0%) (Ministry of Finance, 2004a, p. 495-496).

Iron and Steel.—In 2004, Japan relied 100% on imports to meet the iron ore requirements of its iron and steel industry. Imports of iron ore increased by 2.2% to 134.9 Mt valued at $3.98 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore was $29.56 per metric ton compared with $25.02 per ton in 2003. The major suppliers of iron ore were Australia (63.3%), Brazil (17.8%), India (9.0%), South Africa (3.6%), and the Philippines (3.4%). Imports of pig iron totaled 599,000 t valued at $174.7 million. The average c.i.f. import price of pig iron was $291.86 per ton compared with $187.54 per ton in 2003. The major suppliers of pig iron were China (55.9%), Brazil (18.2%), India (8.6%), Russia (7.5%), North Korea (6.1%), and South Africa (2.2%) (Ministry of Finance, 2004b, p. 169, 626).

To secure the long-term supply of iron ore, Nippon Steel Corp. reached a basic agreement with Companhia Vale do Doce (CVRD) of Brazil for the supply of 7 Mt/yr of iron ore (4 Mt/yr from Carajas and 3 Mt/yr from Itabira) for 10 years beginning in April 2005 through 2014. Nippon Steel also had a 5-year contract for the supply of 2 Mt/yr of Nibrasco pellet with CVRD and a 3-year contract with Mineraçõnes Brasiliras Reunidas S/A (MBR) for the supply of 2 Mt/yr of iron ore; MBR was equally owned by CVRD and Mitsui & Co. of Japan. By combining the three contracts, Nippon Steel's total purchase of iron ore and pellets from Brazil would be of 11 Mt/yr (Nippon Steel Corp., 2004a§).

JFE Steel Corp. reached a basic agreement with BHP Billiton Ltd. of Australia, Itochu Corp., and Mitsui & Co. in August 2004 to establish a joint venture at the Yandi Mine in Australia and signed a long-term iron ore purchase contract with BHP Billiton. The Yandi Mine was an important iron ore source to supply more than 20% of JFE Steel's annual iron ore requirements. The mine produced about 40 Mt/yr and contained about 1 billion metric tons of minable reserves. The joint venture, which was to be established after July 2005 at the Yandi Mine, would be owned by BHP Billiton (68%), JFE Steel (20%), Itochu (6.4%), and Mitsui & Co. (5.6%) for the W-4 mining area where the economically exploitable reserves were estimated to be 110 Mt; from there, up to 15 Mt/yr of iron ore would be produced. According to the long-term iron ore purchase contract, which was valued at about $3.7 billion, JFE Steel would purchase 16 Mt/yr beginning on April 1, 2005, for 11 years or the equivalent of one-third of JFE Steel's annual iron ore requirement (BHP Billiton Ltd., 2004§; JFE Steel Corp., 2004b§).

In September, JFE Steel also signed a contract with CVRD for long-term iron ore supplies. According to the contract, CVRD would supply 7 Mt/yr of iron ore to JFE Steel beginning in April 2007 for 10 years. Under a separate contract signed earlier through Philippines Sinter Corp. (PSC) (a wholly owned subsidiary of JFE Steel), CVRD would supply 2.2 Mt/yr of iron ore to PSC and about 800,000 t/yr of pellet to JFE Steel. By combining the two contracts, JFE Steel's total iron ore purchases from CVRD would be about 10 Mt/yr beginning in April 2007, which would make JFE one of the leading buyers of CVRD iron ore among all Japanese steel producers (JFE Steel Corp., 2004a§).

In November, Nippon Steel and BHP Billiton reached a basic agreement to explore mutually the possibility of a strategic alliance through a joint venture for the development of new mines and the expansion of such existing mines as coking coal, iron ore, and manganese, combined transport (joint vessel arrangement), and major joint studies on the utilization of iron ore and coking coal. Earlier in April, Nippon Steel and the Rio Tinto Group also reached a basic agreement to create a comprehensive alliance for the acquisition of interest in and joint development of Australian coking coal and iron ore mines and the conclusion of a long-term contract for such raw materials and for cooperation in marine transport and technical exchanges regarding the use of metallurgical raw materials (Nippon Steel Corp., 2004a§, b§)

In 2004, pig iron production increased by 1.1% to about 83 Mt, of which 82.4 Mt was for steelmaking and 584,500 t, for foundry. The iron manufacturing capacity, however, decreased

to 82.0 Mt/yr from 84.4 Mt/yr in 2003. The number of furnaces for iron manufacturing decreased to 29 from 31. The number of blast furnaces decreased to 28 from 30 in 2003, and other furnaces remained unchanged at 1 (Ministry of Economy, Trade and Industry, 2004c, p. 32, 107).

In 2004, crude steel production increased by 2.0% to 112.7 Mt, of which 73.6% was processed by basic oxygen furnaces (LD converters), and 26.4%, by electric furnaces. The steel manufacturing capacity increased to 120.8 Mt/yr from 120.5 Mt/yr in 2003. The number of furnaces for steel manufacturing decreased to 415 from 416 in 2003. The number of basic oxygen furnaces (LD converters) remained unchanged at 62, and the number of electric arc furnaces decreased to 353 from 354 in 2003 (Ministry of Economy, Trade and Industry, 2004c, p. 44, 107).

In 2004, Japan was the world's second ranked producer of crude steel after China and accounted for 10.7% of the world total. Among Japan's top four steelmakers in 2004, Nippon Steel, which produced 32.4 Mt of crude steel, was the third ranked steel-producing company in the world after Arcelor S.A. of Luxembourg and Mittal Steel Co. of the Netherlands; JFE Steel, which produced 31.6 Mt, ranked fourth; Sumitomo Metal Industries, Ltd., which produced 13.0 Mt, ranked 14th; and Kobe Steel Ltd., which produced 7.7 Mt, ranked 25th (International Iron and Steel Institute, 2005§).

To develop a next-generation coke oven, an innovative coke production process that features environmental friendliness, energy savings, and high productivity called SCOPE 21 (super coke oven for productivity and environment enhancement in the 21st century) and the basic research and development of Ultra Steel reportedly were completed in fiscal year 2003. Studies were undertaken in 2004 to utilize the next-generation coke oven technology with actual equipment and to put the new Ultra Steel into practical use (Japan Iron and Steel Federation, 2005§).

In 2004, domestic demand for steel, which was measured by domestic orders for ordinary and specialty steel products, increased by 4.6% to about 67.5 Mt, of which 55.2 Mt was ordinary steel products and 12.2 Mt, specialty steel products. The increase in overall domestic demand for steel in 2004 was mainly the result of a 4.3% increase in demand by the manufacturers of automobiles and an 18.4% increase in demand by the manufacturers of shipbuilding and marine equipment. Domestic demand also increased in all other end use categories (table 7).

In 2004, exports of iron and steel increased by 2.6% to 35.3 Mt mainly because of a 7.1% increase in exports to China and a 7.4% increase in exports to Thailand and a relatively high level of exports to the Republic of Korea and Taiwan. Exports to Europe increased by 46.9% to 1.1 Mt and to the United States, by 31.0% to 1.4 Mt in 2004 (table 8). Of the exports of iron and steel, 73.6% was ordinary steel products; 15.2%, specialty steel products; 8.8%, steel ingots and semifinished products; 1.7%, secondary products; 0.1%, pig iron; and 0.6%, others (ferroalloy, clad plate, and cast-iron pipes). In 2004, Japan also exported 136,629 t of ferroalloy compared with 130,830 t in 2003 (Japan Iron and Steel Federation, 2005§).

In 2004, imports of iron and steel products increased by 18.4% to 7 Mt owing mainly to a 21.4% increase in imports of ordinary steel products. Of the total imports, 3.5 Mt was ordinary steel products; 2.7 Mt was pig iron, ferroalloys, steel ingot, and semimanufactured steel; 498,837 t, secondary steel wire and other secondary steel products; and 299,163 t, specialty steel products. Among the ordinary steel product imports, hot-rolled wide strip increased by 10.1%; cold-rolled sheet and strip, by 17.2%; and plates, by 110%. Specialty steel product imports jumped by140% to 300,000 t. The major suppliers of ordinary steel products were the Republic of Korea (54.7%), Taiwan (23.2%), and China (15.8%) in 2004 (Japan Iron and Steel Federation, 2005§).

Japan' export earnings from iron and steel products were valued at $28.9 billion, and the import bill of iron and steel products was valued at $8.8 billion in 2004 (Ministry of Finance, 2004a, p. 37-38; 2004b p. 37-38).

Manganese.—Japan relied entirely on imports to meet its manganese raw material requirements for the iron and steel and EMD industries. In 2004, Japan imported 1.08 Mt of high-grade manganese ore, 102,645 t of ferruginous manganiferous ore, 75,323 t of low-grade manganese ore, and 900 t of high-grade manganese dioxide ore. The major suppliers of high-grade manganese dioxide ore were China (44.4%), Colombia (33.3%), and Gabon (22.2%). The major suppliers of high-grade manganese ore were South Africa (62.0%) and Australia (36.1%). The major suppliers of low-grade manganese ore were Ghana (72.1%) and South Africa (27.8%). The major suppliers of ferruginous manganiferous ore were South Africa (71.4%) and India (27.1%). The import bill for manganese ores totaled $167.0 million (Ministry of Finance, 2004b, p. 169).

Production of ferromanganese increased by 17.6% to 437,400 t in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 34). As a result, imports of ferromanganese decreased by 41.4% to 51,200 t in 2004. The major suppliers were Australia (35.3%), China (30.9%), South Africa (25.7%), and the Republic of Korea (4.7%). In 2004, Japan also imported 300,452 t of ferrosilicomanganese principally from China (65%), Ukraine (11.0%), and India (8.5%). The import bill for ferromanganese and ferrosilicomanganese was valued at $334.1 million (Ministry of Finance, 2004b, p. 627-628).

Consumption of high- and low-carbon ferromanganese for steel manufacturing increased slightly to 396,000 t, of which 337,000 t was high-carbon ferromanganese and 59,000 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2004c, p. 216). Exports of ferromanganese decreased by 43.3% to 9,900 t in 2004. The major buyers were Taiwan (42.5%), the Republic of Korea (13.2%), the United States (12.2%), Malaysia and Thailand (7.7% each), and Saudi Arabia (6.1%). Export earnings from ferromanganese were valued at $11.5 million (Ministry of Finance, 2004a, p. 500).

In 2004, 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 (32,000 t/yr) in Miyazaki Prefecture and the Thessaloniki (Salonita) plant (18,000 t/yr) in Greece. In 2004, Japan produced about 45,700 t of EMD, about 17,600 t of which was consumed domestically for the production of batteries. In 2004, imports of EMD totaled 6,980 t valued at $7.7 million.

China and South Africa were the principal suppliers and accounted for 71.5% and 18.7%, respectively. Exports of EMD totaled 29,822 t valued at $36.6 million. The major buyers were Indonesia (27.7%), Singapore (18.8%), China (12.3%), the Republic of Korea (10.3%), the United States (7.1%), Germany (6.3%), and Hong Kong (5.6%) (Arumu Publishing Co. Ltd., 2005, p. 38; Ministry of Finance, 2004a, p. 114; 2004b, p. 182).

Manganese was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of ferromanganese nugget. As of December 2004, the National Stockpile Program had 31.8 days' supply, or 75.6% of its target. The National Stockpile Program sold 15,000 t of ferromanganese for the first time in April 2004; this stockpile release was taken during normal market conditions and was not in response to a rapid rising price period (Japan Oil, Gas and Metals National Corp., 2005b).

Molybdenum.—Japan was one of the world's leading consumers of molybdenum and relied entirely on imports to meet the requirements for its iron and steel and molybdenum metal manufacturing industries. In 2004, imports of roasted molybdenum trioxide (MoO_3) increased by 8.4% to 35,462 t valued at $605.4 million. The major suppliers were Chile (55.8%), Mexico (14.0%), Canada (9.6%), China (6.1%), and the United States (5.8%) (Ministry of Finance, 2004b, p. 170).

In 2004, consumption of molybdenum concentrate totaled 10,303 t, of which 4,683 t was for the production of ferromolybdenum; 2,211 t, for the production of inorganic chemicals; 897 t, for the production of molybdenum metal; 815 t for the production of molybdenum briquette clinker; and 1,696 t for other (Ministry of Economy, Trade and Industry, 2004c, p. 286).

Production of molybdenum metal and ferromolybdenum increased by 44.7%, and 23.5%. respectively, in 2004 because of stronger demand by the makers of specialty steel and magnetic materials. To meet domestic demand, Japan also imported 5,066 t of ferromolybdenum valued at $97.2 million. The principally suppliers were China (92.4%) and Chile (6.1%). Imports of molybdenum metal, which included ingots and powders, totaled 974 t valued at $35.3 million. The major suppliers of molybdenum metals were Germany (38.4%), China (33.4%), and the United States (26.8%) (Ministry of Finance, 2004b, p. 628, 675).

Consumption of ferromolybdenum by the steel manufacturers totaled 5,644 t in 2004. Consumption of molybdenum metal totaled 2,980 t, of which 72% was consumed by the makers of specialty steel; 18.8%, by makers of steel wire, sheet, and bar; and 9%, by makers of magnetic materials and other. Exports of molybdenum metal totaled 76.5 t valued at $3.3 million in 2004. The major buyers were the Republic of Korea (36.6%), the United States (30.1%), and Thailand (15.0%) in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 216, 286; Ministry of Finance, 2004a, p. 586).

Molybdenum was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of crude oxide powder, soluble oxide powder, and pure oxide powder. As of December 2004, the National Stockpile Program had 21 days' supply, or 50% of its target. The National Stockpile Program released 20.4 t of molybdenum crude oxide in June 2003 and 11.9 t of molybdenum crude oxide again in February 2004 during normal market conditions and released 202.7 t of molybdenum crude oxide in April 2004 and 19.4 t of molybdenum soluble oxide and pure oxide in December 2004 during a period of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Nickel.—Japan continued to rely on imported raw materials to meet its nickel requirements in 2004. Japan was the world's leading importer and consumer of nickel. Japan was the world's second ranked producer of nickel metal after Russia (World Bureau of Metal Statistics, 2005, p. 104). All nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide sinter, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel also were imported to meet the nickel requirements of the battery, magnetic materials, nonferrous alloys, specialty steel industries, and other end users.

In 2004, imports of nickel ore increased by 7.3% to 4.5 Mt valued at $290.6 million. The suppliers of nickel ore were Indonesia (51.7%), the Philippines (24.3%), and New Caledonia (24.0%). Imported nickel ore from Indonesia contained 37,500 t of nickel; the Philippines, 18,500 t of nickel; and New Caledonia, 19,500 t of nickel. Imports of nickel mattes, in gross weight, increased by 6.1% to 127,400 t valued at $1.1 billion in 2004. The suppliers of nickel matte were Indonesia (74.1%) and Australia (25.9%). Imported nickel mattes from Indonesia contained 70,800 t of nickel and Australia, 24,700 t (Japan Mining Industry Association, 2005, p. 107; Ministry of Finance, 2004a, p. 170, 667).

Imports of ferronickel, in gross weight, decreased by 2.5% to 55,600 t valued at $225.5 million. The suppliers of ferronickel were New Caledonia (66.1%), Colombia (15.2%), the Dominican Republic (13.6%), and Indonesia (4.9%). Imports of refined nickel decreased by 3.1% to 51,960 t valued at $718.0 million. The top suppliers of refined nickel were Russia (19.4%), South Africa (14.2%), China (13.0%), Australia (11.9%), Brazil (10.3%), Zimbabwe (9.3%), Norway (8.0%), Canada (6.6%), and the United Kingdom (5.1%). Imports of nickel oxide sinter, in gross weight, increased by 1.5% to 1,250 t valued at $13.9 million; Australia was the dominant supplier of nickel oxide sinter and accounted for 93.1%. Imports of nickel powders and flakes increased by 28.7% to 9,950 t valued at $131.6 million. The major suppliers of nickel powders and flakes were Canada (48.9%) and the United Kingdom (46.9%). Imports of nickel waste and scrap decreased by 11.8% to 9,400 t valued at $101.9 million. The major suppliers of nickel waste and scrap were the United States (21.5%), the Netherlands (20.3%), Russia (15.1%), the Republic of Korea (14.2%), and Taiwan (8.7%) (Ministry of Finance, 2004b, p. 628, 667).

In 2004, the following companies produced ferronickel: Hyuga Smelting Co. Ltd. (a wholly owned subsidiary of Sumitomo Metal Mining) in Hyuga, Miyazaki Prefecture; YAKIN Oheyama Co. Ltd. (Nippon Yakin Kogyo Group) at Oheyama near Miyazu, Kyoto Prefecture; and Pacific Metals Co. Ltd. in Hachinohe, Aomori Prefecture. Production of ferronickel, in gross weight, increased by 1.4% to 374,200 t, which contained about 74,300 t of nickel. Consumption of ferronickel for steel manufacturing, in gross weight, increased

by 1.9% to 314,000 t in 2004 (Arumu Publishing Co. Ltd., 2005, p. 70; Ministry of Economy, Trade and Industry, 2004c, p. 38, 210). Exports of ferronickel increased by 8.8% to 111,000 t valued at $271.9 million, of which 54.6% went to the Republic of Korea and 43.4%, to Taiwan (Ministry of Finance, 2004a, p. 500).

Refined nickel was produced solely by Sumitomo Metal Mining 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 exports. 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 exports.

At the end of August 2004, Sumitomo Metal Mining completed construction 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 laterite low-grade nickel oxide lateritic ore. The total investment by Sumitomo Metal Mining in the project was approximately $180 million. The processing plant, which was expected to operate for a period of about 20 years, started test operations after plant construction was completed in August 2004 and was scheduled begin full-scale commercial production in early 2005. The nickel project got underway after the Coral Bay Nickel Corporation, which was a joint venture of four cooperation partners, was established in April 2002; the four partners and their equity shares were Sumitomo Metal Mining (54%), Mitsui & Co. and Sojitz Corporation (18% each), and Rio Tuba Nickel Mining Corporation (10%). The project's plan called for the plant to process 16 Mt of nickel oxide ores and low-grade laterite (limonite), which were mined and stockpiled at the Rio Tuba mine site, by using high-pressure acid leaching (HPAL), and to produce about 10,000 t of nickel and 700 t of cobalt in nickel/cobalt mixed sulfide, which would be purchased by Sumitomo Metal Mining and delivered to its Niihama Nickel Refinery for the production of electrolytic nickel and electrolytic cobalt with its own MCLE process technology (Sumitomo Metal Mining Co. Ltd., 2004a§).

In October, Sumitomo Metal Mining and Mitsui & Co. jointly announced that they had reached an agreement in principle with Inco Limited to participate jointly in the Goro Nickel Project, which was being promoted by Inco in New Caledonia, and that they had concluded a memorandum of understanding (MOU) to negotiate a definitive agreement with Inco concerning the terms and conditions of their acquisition and certain other arrangements covering their participation in the project. The large-scale Goro Nickel Project, which has an extensive nickel resource base, was expected to start production in late summer 2007 by using the HPAL process technology. The project would have a mine capacity of 60,000 t/yr of nickel in nickel oxide and between 4,300 and 5,100 t/yr of cobalt in cobalt carbonate. Sumitomo Metal Mining and Mitsui & Co. would have the right to offtake nickel and cobalt in proportion to each company's equity ratio. According to the earlier reviewing study, the total project capital cost was about $1.87 billion. Sumitomo Metal Mining was expected to acquire 11% of the project's equity interest and Mitsui & Co., 10% (Sumitomo Metal Mining Co. Ltd., 2004c§).

In 2004, the domestic demand for refined nickel decreased by 1.5% to 68,400 t owing to weaker demand by the manufacturers of specialty steel. The consumption of refined nickel by manufacturers of specialty steel decreased by 5.3% to 55,300 t and galvanized sheet decreased by 6.6% to 2,890 t. Consumption increased for batteries by 39.8% to 4,440 t; magnetic materials, 21.1% to 2,230 t; catalysts, 17.6% to 480 t; and other end uses, 19.2% to 3,060 t (Ministry of Economy, Trade and Industry, 2004c, p. 280).

Exports of refined nickel increased by 114.4% to 223 t valued at $3.7 million in 2004. The major buyers of refined nickel were Indonesia (50.0%), Thailand (31.4%), the Philippines (8.4%), and China (7.3%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 17.1% to 32,700 t valued at $390.9 million. The principal buyers were the Republic of Korea (51.4%), Taiwan (46.4%), and the Netherlands (2.1%). Exports of nickel powders and flakes remained about the same at 1,670 t valued at $50.8 million in 2004. The major buyers were China (62.0%), Taiwan (19.5%), and France (5.0%). Exports of nickel waste and scrap decreased by 38.3% to 400 t valued at $3.2 million in 2004. The major buyers were the United States (44.2%), the United Kingdom (31.5%), and Taiwan (14.9%) (Ministry of Finance, 2004a, p. 576).

Nickel was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of nickel metal plate, ferronickel ingot, and nickel oxide granule and briquette. As of December 2004, the National Stockpile Program had 25.6 days' supply, or 61% of target. During the past 21 years, the National Stockpile Program has never released or sold any nickel in any form either in normal market conditions or in a period of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Titanium.—Japan was the world's second ranked producer of titanium sponge metal after Russia and accounted for 30.7% of the world total (Arumu Publishing Co. Ltd., 2005, p. 54). Japan also was one of the world's major producers of titanium dioxide pigment. All the raw material requirements for production of titanium sponge metal and titanium dioxide pigment were supplied by imports, 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 2004, imports of titanium ore (rutile) increased by 2.1% to 90,000 t valued at $44.2 million. The major suppliers were Australia (56.7%), India (30.6%), South Africa (7.4%), and Canada (5.1%). Imports of ilmenite decreased by 2.4% to 360,300 t valued at $39.1 million. The major suppliers were Vietnam (42.3%), Australia (23.5%), Canada (14.8%), India (9.0%), Egypt (7.7%) and Malaysia (2.7%) in 2004 (Ministry of Finance, 2004b, p. 170). In 2004, imports of titanium slag for titanium oxide pigment production increased by 30.1% to 132,000 t and came mainly from South Africa (66.8%) and Canada (32.9%) (Arumu Publishing Co. Ltd., 2005, p. 99).

According to the estimate by Advanced Materials Japan Corporation, production of titanium sponge increased by

24.2% to 23,500 t in 2004 because of the stronger domestic demand and increased exports to the EU. Total titanium sponge shipments increased by 40.9% to 26,200 t in 2004. Shipments of titanium sponge to the domestic market increased by 39.5% to 18,000 t. In 2004, exports of titanium sponge increased by 36.2% to 8,120 t, and imports decreased by 2.5% to 5,570 t. In 2004, shipments of titanium mill products increased by 25.6% to 17,400 t; domestic shipments of titanium mill products increased by 25.9% to 8, 570 t, and exports of titanium mill products increased by 25.4% to 8,810 t (Arumu Publishing Co. Ltd., 2005, p. 54-55).

Because of rising worldwide demand for titanium sponge metal, Toho Titanium Co. Ltd. planned to spend $14.56 million to boost its sponge production capacity by 7.7% to 14,000 t/yr by February 2005 and to expand the capacity to 15,000 t/yr by October 2005. Sumitomo Titanium Corp., however, did not announce any plans to boost its sponge metal production capacity, but it was expected to operate at its full capacity of 18,000 t/yr in 2005. Kobe Steel, which was a major producer of titanium mill products, estimated that the worldwide demand for titanium mill products would reach more than 50,000 t compared with about 38,000 t in 2003 (Yahoo.com, 2004§).

In 2004, production of titanium dioxide decreased slightly to 253,400 t owing to a weaker domestic demand (Ministry of Economy, Trade and Industry, 2004b, p. 60). Shipments of titanium dioxide totaled 254,800 t, of which domestic shipments were 167,300 t and exports, 87,500 t. In 2004, consumption by the end users was for paints and coating materials (44.5%), printing inks and pigments (21.6%), synthetic resin (plastics) (10.8%), paper (8.9%), chemical fibers and rubbers (1.5%, each), condensers (1.1%), and others (10.1%) (Arumu Publishing Co. Ltd., 2005, p. 99).

Imports of titanium oxide increased by 31.1% to 15,200 t valued at $21.6 million. The major suppliers were China (56.7%), the Republic of Korea (23.5%), France (10.7%), and Australia (5.4%) in 2004 (Ministry of Finance, 2004b, p. 182). Exports of titanium oxide increased by 8.5% to 31,100 t valued at $92.0 million. The major buyers were China (41.4%), Taiwan (26.9%), the Republic of Korea (8.6%), the United States (4.9%), Indonesia (3.2%), and the Netherlands and Thailand (2.2% each) in 2004 (Ministry of Finance, 2004a, p. 114).

Tungsten.—Japan's last tungsten mine, the Kiwada Mine in Yamaguchi Prefecture, was closed in 1993. Japan has relied on imports to meet tungsten requirements for its iron and steel and tungsten metal manufacturing industries since 1994. In 2004, Japan imported 134 t of tungsten ore and concentrate (contained 73 t tungsten) principally from Russia (97.8%) and 2,788 t of ammonium tungstate principally from China (99.9%) with a combined value of $21.2 million in 2004. Japan also imported 1,329 t of ferrotungsten (contained 1,023 t tungsten) entirely from China valued at $9.4 million in 2004. Consumption of ferrotungsten for steel manufacturing, in gross weight, amounted to 1,006 t in 2004 (Ministry of Economy, Trade and Industry, 2004c, p. 216; Ministry of Finance, 2004a, p. 170, 188;).

In 2004, production of tungsten metal increased by 25% to 4,166 t. The major producers of tungsten metal and powder were Japan Newer Metals Co. Ltd., Toho Kinzoku Ltd., and Tokyo Tungsten Co. Ltd. To meet domestic demand for tungsten powder and metal, Japan imported 663 t of tungsten powder mainly from China (80.5%) and Germany (10.9%) and 142 t of tungsten metal principally from China (99.9%) in 2004. In 2004, demand for tungsten metal, which included powder, decreased by 37.8% to 6,126 t owing to a sharp drop in demand by the makers of contact points. In 2004, about 89% of tungsten metal was consumed by the makers of ultra-hard alloyed tool steel, and the remainder, by the makers of bars, contact points, plates, specialty steel, and wire. Japan exported 186 t of tungsten powder mainly to Thailand (36%), and China, Austria, and the United States (18% each) (Ministry of Finance, 2004a, p. 585; 2004b, p. 674-675; Ministry of Economy, Trade and Industry, 2004c, p. 284-285).

Tungsten was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of scheelite and wolframite powder. As of December 2004, the National Stockpile Program had 29.7 days' supply, or 70.8% of its target. During the past 21 years, the National Stockpile Program has never released or sold any tungsten in any form in any market conditions (Japan Oil, Gas and Metals National Corp., 2005b).

Vanadium.—Japan recovered vanadium pentoxide from petroleum residues, ashes, and spent catalysts. Estimated secondary production of vanadium pentoxide, in vanadium metal content, by Shinko Chemical Co. Ltd. and Taiyo Mining and Industry Co. Ltd. totaled between 890 and 1,000 t/yr during the 2001 to 2004 period. To meet the domestic requirements for its iron and steel industry, Japan imported 2,274 t of vanadium pentoxide valued at $26.5 million mainly from South Africa (52.8%) and China (47.2%). In 2004, imports of ferrovanadium totaled 5,518 t valued at $87.8 million mainly from South Africa (74.7%), Russia (7.6%), and Taiwan and China (5.4% each) (Ministry of Finance, 2004b, p. 183, 628).

Production of ferrovanadium decreased by 37.6% to 2,178 t in 2004 owing to the high production cost directly related to the high import price of vanadium pentoxide, which increased by 169% in 2004. Consumption of ferrovanadium by the steel manufacturers was 6,670 t in 2004. Exports of ferrovanadium totaled 77 t valued at about $1 million. The main buyers were South Africa (49.9%), Taiwan (31.7%) and Thailand (15.5%) in 2004 (Arumu Publishing Co. Ltd., 2005, p. 89; Ministry of Finance, 2004a, p. 500; Ministry of Economy, Trade and Industry, 2004c, p. 216).

Vanadium was one of the seven rare metals stockpiled by the National Stockpile Program. It was stockpiled in the form of ferrovanadium nugget. As of December 2004, the National Stockpile Program had 21.4 days' supply, or 50.9% of its target. The National Stockpile Program released 80 t ferrovanadium between April and June 1998, 16.3 t in March 2004, 16.2 t in May 2004, and 97.9 t in November 2004. All ferrovanadium was sold during periods of rising prices (Japan Oil, Gas and Metals National Corp., 2005b).

Industrial Minerals

Cement.—In 2004, Japan was the world's fourth ranked cement producer and consumer after China, India, and the

United States (van Oss, 2005). The cement industry comprised 18 companies with about 3,550 workers and 33 cement plants concentrated in the areas of Chugoku and Kyushu, where most of Japan's limestone resources and limestone quarries are located (Ministry of Economy, Trade and Industry, 2004a, p.142, 145; Japan Cement Association, 2005§). Japan's cement industry's clinker capacity decreased to 76 Mt/yr from 81.4 Mt/yr in 2003. Production of cement clinker decreased to 65.4 Mt from 66.8 Mt in 2003, and production of cement decreased to 67.4 Mt from 68.8 Mt in 2003 because of continued weakness in the domestic demand for cement owing to cutbacks in public works spending.

Of the total cement produced in 2004, 51.3 Mt was portland cement, of which 47.8 Mt was ordinary portland cement and 3.5 Mt, high early-strength and moderate-heat portland cement; 15.3 Mt, blast-furnace slag cement; 120,000 t, fly ash cement; 70,000 t, white cement; and 552,000 t, other cement. The major raw materials consumed by the cement industry included 75.3 Mt of limestone, 9.9 Mt of clay, 5.7 Mt of silica stone, 5.2 Mt of blast furnace ore slag, and 2.6 Mt of gypsum. The cement industry consumed about 36,000 t of LPG and 1.6 billion kilowatts hours of electricity in 2004 (Ministry of Economy, Trade and Industry, 2004a, p. 76-80, 137, 142).

In 2004, cement shipments decreased by 1.8% to 66.8 Mt owing mainly to the decreased demand for portland cement. Exports of cement clinker increased slightly to 4.94 Mt valued at $93.8 million, and those of portland cement increased by 10.8% to 5.34 Mt valued at $116.2 million. The major buyers of cement clinker were China (27.1%), Hong Kong (23.9%), Australia (17.9%), Malaysia (10.2%), and Cote d'Ivoire (4.9%). The major buyers of portland cement were Singapore (26.6%), the Republic of Korea (23.3%), Hong Kong (16.4%), China (14.5%), Nigeria (7.2%), Taiwan (6.0%), Australia (2.3%). The average export free-on-board (f.o.b.) price of portland cement increased to $21.77 per ton in 2004 from $20.17 per ton in 2003 (Ministry of Finance, 2004a, p. 101). Japan imported only 3,653 t of cement clinker mainly from China (56.9%) and the United States (35.3%). Imports of portland cement totaled 815,400 t. The Republic of Korea was the dominant supplier and accounted for 97.2%. The average import c.i.f. price of portland cement increased to $39.01 per ton in 2004 from $36.15 per ton in 2003 (Ministry of Finance, 2004b, p. 168).

Taiheiyo Cement Corp., which was Japan's leading cement producer, had taken action in response to the continued decline in domestic demand for cement during the past 3 years. The company reportedly shut down the No. 5 kiln, one of two at the Saiki plant in Oita Prefecture in March 2002 and dissolved one of its cement manufacturing subsidiaries (Kawara Taiheiyo Cement Corp.) in Fukuoka Prefecture in March 2004 (Taiheiyo Cement Corp., 2005§).

Limestone.—Japan was one of the world's top limestone producers in 2004. Production decreased by 1.0% to 161.9 Mt, which was a new low since 1986; this was a result of decreased demand for the production of cement, ferroalloy, and steel in the manufacturing sector and for roads and concrete aggregate in the construction sector.

Domestic limestone demand decreased by 1.2% to 153.6 Mt in 2004. Domestic limestone demand by end use was for cement (41.7%), concrete aggregate (21.9%), ferroalloys and steel smelting (15.0%), roads (5.3%), for making glass, refractories, and soda (0.7%), and other uses (15.4%) (Ministry of Economy, Trade and Industry, 2004d, p. 132, 135).

In 2004, Japan's imports of limestone flux, limestone, and other calcareous stone totaled 339,800 t valued at $12.3 Mt. The major suppliers were Malaysia (44.1%), Vietnam (28.6%), the Philippines (14.1%), and China (12.9%). Exports of limestone flux, limestone, and other calcareous stone totaled 2.99 Mt valued at $21.7 million. The major buyers were Taiwan (62.4%), Australia (19.2%), and the Republic of Korea (18.2%) (Ministry of Finance, 2004a, p. 101; 2004b, p. 168).

Mineral Fuels

Coal.—In 2004, Japan relied 100% on imports to meet its annual requirements for coking coal and anthracite, and about 99% to meet its annual requirements for steam (thermal) coal. Japan was the world's leading importer of steam coal mainly for consumption by the cement, paper, and utility industries. Japan also was the world's leading importer of coking coal for consumption by the iron and steel industry. Japan produced a small quantity of steam coal from several small-scale coal mines mainly in Hokkaido for consumption by the local power generation plants.

In 2004, coal was produced mainly by a 700,000-t/yr-capacity underground mine operated by Kushiro Coal Mine Co. Ltd., and 11 small-scale open pit mines (10 in Hokkaido Prefecture and 1 in Yamaguchi Prefecture). The Kushiro Mine was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia. Among the 11 small-scale coal mining companies, 2 in Hokkaido Prefecture were closed by the end of December and 2 in Hokkaido and 1 in Yamaguchi Prefecture were scheduled to be closed by the end of March 2005 (Japan Coal Energy Center, 2005).

In 2004, Japan's overall coal imports increased by 7.8% to 180.0 Mt valued at $10.11 billion, of which 118.3 Mt was bituminous coal (steam other than coking coal); 55.8 Mt, coking coal; and 5.9 Mt, anthracite. The major suppliers of coking coal were Australia (68.5%), Canada (9.5%), China (9.2%), the United States (6.1%), and Russia (5.7%); the major suppliers of bituminous coal (steam coal) were Australia (54.2%), Indonesia (21.1%), China (17.9%), and Russia (5.0%); and the major suppliers of anthracite were China (43.9%), Vietnam (43.1%), North Korea (4.4%), and Russia (4.3%) (Ministry of Finance, 2004b, p. 171).

To meet Japan's Kyoto Protocol commitments to slash greenhouse gas emissions, the Government of Japan began to levy a carbon tax on import coal at a rate of ¥230 per metric ton, or about $2.13 per metric ton on October 1, 2003. The coal import tax will be raised to ¥460 per ton on April 1, 2005, and further to ¥700 per ton on April 1, 2007 (Shinji, Tomita, Researcher, Planning and Coordination Department, Japan Coal Energy Center, written commun., May 20, 2005). The carbon tax was intended to depress demand for fossil fuels, such as coal, which produce greenhouse gases.

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, 2003). In 2004, domestic production of natural gas and crude petroleum totaled 2.88 billion cubic meters and 5.25 Mbbl, respectively, or about 4.5% of the 78.8 billion cubic meters of domestic natural gas consumption and 0.35% of the 1.5 billion barrels (Gbbl) of domestic crude petroleum consumption, respectively. In 2004, Japan imported 75.2 billion cubic meters of natural gas in the form of LNG and 1.53 Gbbl of crude petroleum (Ministry of Economy, Trade and Industry, 2004d, p. 26-27, 32-43, 78, 119).

According to the Ministry of Finance (2004b, p. 177) trade statistics, however, imports of LNG totaled 56.97 Mt (85.28 billion cubic meters) valued at $15.2 billion in 2004. The major suppliers of LNG were Indonesia (27.6%), Malaysia (21.7%), Australia (14.3%), Qatar (12.0%), Brunei (10.7%), the United Arab Emirates (9.3%), and the United States (2.2%). Crude petroleum imports were mainly from the Middle East (88.9%) and Southeast Asia (5.3). The major suppliers of crude petroleum were the United Arab Emirates (25.3%), Saudi Arabia (24.5%), Iran (15.0%), Qatar (9.3%), Kuwait (7.3%), Indonesia (3.5%), the Neutral Zone (of Kuwait and Saudi Arabia) (2.7%), Oman (2.4%), Iraq and Nigeria (2.2% each), and Sudan (1.8%). Imports of crude petroleum were valued at $55.9 billion (Ministry of Economy, Trade and Industry, 2004d, p. 28-34; Ministry of Finance, 2004b, p. 172-173).

In 2004, domestic demand for refined petroleum, by product, was as follows: gasoline, 385.1 Mbbl; heavy fuel oil, 354.2 Mbbl; naphtha, 304.5 Mbbl; diesel (distillate fuel oil), 239.5 Mbbl; kerosene, 172.4 Mbbl; jet fuel, 30.4 Mbbl; asphalt, 22.8 Mbbl; lubricants, 13 Mbbl; and paraffin wax, 406,000 barrels (bbl). To meet its domestic demand, Japan imported a total of 233 Mbbl of refined petroleum products in 2004. The imported refined petroleum products included 184.5 Mbbl of naphtha, 8.9 Mbbl of kerosene, 16.8 Mbbl of heavy fuel oil, 17.1 Mbbl of gasoline, 3.4 Mbbl of diesel, 2.3 Mbbl of jet fuel, 296,000 bbl of lubricants, and 47,000 bbl of paraffin wax (Ministry of Economy, Trade and Industry, 2004d, p. 80-81).

In 2004, consumption of domestically produced natural gas was follows: gas (51.3%), electric power (15.2%), oil and gas (14.9%), chemical (12.6%), and other manufacturing and service (6.0%) industries. Of the 50.2 Mt (75.2 billion cubic meters) of imported natural gas in the form of LNG, 70% was consumed by the electric power industry for power generation and 30% was for gas and industrial use (Ministry of Economy, Trade and Industry, 2004d, p. 26, 118).

At the end of 2004, Japan's stockpile of crude petroleum and partially refined and refined petroleum products totaled 172 days' supply—91 days in the national (Government-owned) stockpile and 81 days in the private (privately owned) stockpile (Ministry of Economy, Trade and Industry, 2004d, p. 142-143).

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 produce. 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 and complete infrastructures for its mining and mineral-processing industries in the world. Despite its small land area, Japan had a highway system of 1.17 million kilometers, of which 903,300 km was paved and 268,300 km, unpaved. The railroad network had 23,600 km, of which 16,500 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 with 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 Oceans)]; submarine cables to China, the Philippines, Russia, and the United States (via Guam); and 73 Internet service providers (as of 2000) and 12,962,000 internet hosts (2003). For electric power generation, Japan had 4,683 powerplants with a total capacity of 266.1 million kilowatts (as of 2002). For electric power transmission, Japan had a route length of 94,000 km and a circuit length of 166,000 km (as of 2002). For power distribution, Japan's total length of line distances, which included high- and low-voltage, was 1,255,000 km (as of 2002) 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, 170 km for oil, and 60 km for oil, gas, and water (as of 2003).

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; Fukuoka, Kita Kyushu, Moji, and Oita on Kyushu; Hakodate, Kushiro, Muroran, and Tomakomai on Hokkaido; and Sakaide on Shikoku.

Japan had 174 airports and 15 heliports in 2004. 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 has been forecasted to continue to grow in 2005 but at a slower pace (0.8%) and then to grow at a faster pace (1.9%) in 2006 (International Monetary Fund, 2005§). Domestic mining activities during the next 2 years are expected to hold steady or decline slightly in the industrial minerals and lead, silver, and zinc production mainly because of the depleting ore reserves. Metal production of copper and zinc is expected to hold steady or increase slightly as domestic demand for the metals continues its upward trend in 2005. During the next 2 years, production of crude steel is expected to remain within a narrow range of between 112 and 113 Mt because of the continued strong demands from the Japanese automobile and machinery and equipment sectors and an anticipated high level of exports to such Asian countries as China, the Republic of Korea, 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 EU. Production of cement and limestone is expected to hold steady or decrease slightly owing to anticipated cutbacks in public works spending.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue exporting more ferrous and nonferrous metals and cement clinker and cement to ASEAN countries, China, the Republic of Korea, 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 trends 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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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		2000	2001	2002	2003	2004
METALS						
Aluminum:						
Alumina	thousand metric tons	369	331	333	363 r	340 e
Aluminum hydroxide	do.	782	739	724	740	730 e
Metal:						
Primary:						
Regular grades	do.	7	7	6	6	6
High-purity	do.	41	27	40	44	55
Secondary[2]	do.	1,214	1,171	1,239	1,261 r	1,015
Antimony:						
Oxide		11,051	8,789	9,052	8,190 r	8,716
Metal		146	101	183	121	222
Arsenic, high-purity[e]		100	100	100	100	100
Bismuth		520	551	474	513	522
Cadmium, refined		2,472	2,460	2,444	2,509	2,233
Chromium, metal[e]		750	1,350	1,600	1,500	1,600
Cobalt, metal		311	350	354	379	429
Copper:						
Mine output, Cu content		1,211	744	--	--	--
Metal:						
Blister and anode:						
Primary		1,331,352	1,328,489	1,317,291	1,343,353	1,270,995
Secondary		149,282	139,764	182,069	172,724	194,927
Total		1,480,634	1,468,253	1,499,360	1,516,077	1,465,922
Refined:						
Primary		1,290,091	1,287,165	1,211,111	1,251,728	1,188,491
Secondary		147,260	138,526	189,968	178,637	191,653
Total		1,437,351	1,425,691	1,401,079	1,430,365	1,380,144
Gallium, metal:						
Primary[e]		14	8	8	9	9
Secondary		56	62	80	83	81
Germanium:						
Oxide[e]		10	10	20 r	30 r	50
Metal	kilograms	1,809	1,615	803	621	943
Gold:						
Mine output, Au content	do.	8,400	7,815	8,615	8,143	8,021
Metal:						
Primary	do.	146,061	155,826	144,748	161,399	136,616
Secondary[3]	do.	19,280	19,831	21,160	22,549	23,183
Total	do.	165,341	175,657	165,908	183,948	159,799
Indium, metal[e]	do.	55,078 [4]	55,000	60,000	70,000	70,000
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight		1,454	750	-- r, e	-- r, e	-- e
Fe content		523	258	-- r, e	-- r, e	-- e
Metal:						
Pig iron and blast furnace ferroalloys	thousand metric tons	81,071	78,836	80,979	82,091	82,974

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS--Continued						
Iron and steel--Continued:						
Metal--Continued:						
Electric-furnace ferroalloys:						
Ferrochrome		130,074	111,167	91,937	19,427	13,472
Ferromanganese		337,694	368,293	356,717	371,831	437,389
Ferronickel		367,181	367,739	370,973	369,099	374,213
Silicomanganese		67,926	62,238	70,965	58,043	73,041
Other:						
Ferromolybdenum		3,699	3,485	2,375	2,691	3,323
Ferrotungsten		42	109	9	12	--
Ferrovanadium		4,108	3,613	3,592	3,491	2,178
Unspecified		7,171	5,733	6,376	3,813	7,321
Total		917,895	922,377	902,944	828,407	910,937
Steel, crude	thousand metric tons	106,444	102,866	107,745	110,511	112,718
Semimanufactures, hot-rolled:						
Ordinary steels	do.	83,044	78,927	80,838	81,769	83,354
Special steels	do.	15,747	15,835	17,451	18,735	19,843
Lead:						
Mine output, Pb content		8,835	4,997	5,723	5,660	5,512
Metal, refined:						
Primary		129,469	127,358	107,744	105,460	94,272
Secondary		182,209	175,088	178,016	189,831	188,601
Total		311,678	302,446	285,760	295,291	282,873
Magnesium, metal, secondary[e]		10,000	10,000	9,000	10,000	10,000
Manganese, oxide		63,379	51,095	45,867	49,115	45,680
Molybdenum, metal		626	610	465	561	812
Nickel metal:						
Refined		36,230	32,526	32,303	34,991	32,769
Ni content of nickel oxide sinter		47,020	49,600	48,950	52,663 [r]	60,285
Ni content of ferronickel		74,753	68,113	74,418	75,399 [r]	74,261
Ni content of chemical		2,721	2,394	1,820	2,084	2,082
Total		160,724	152,633	157,491	165,137 [r]	169,397
Platinum-group metals:						
Palladium, metal	kilograms	4,712	4,805	5,618	5,500 [e]	5,300 [e]
Platinum, metal	do.	782	791	762	770 [e]	750 [e]
Rare-earth oxides[5]		5,619	5,109	5,423	5,521	6,015
Selenium, metal		612	735	752	734	599
Silicon, high-purity		4,688	4,334	4,453 [r]	5,045	6,135
Silver:						
Mine output, Ag content	kilograms	103,781	80,397	81,416	78,862	75,689
Metal:						
Primary	do.	2,384,739	2,293,028	2,259,551	2,453,204	2,208,270
Secondary[3]	do.	345,358	303,804	291,955	258,754	219,047
Total	do.	2,730,097	2,596,832	2,551,506	2,711,958	2,427,317
Tantalum, metal[e]		85	90	90	95	95
Tellurium, metal		36	39	29	33	33
Tin, metal, smelter		593	668	659	662	707

See footnotes at end of table.

TABLE 1--Continued

JAPAN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
METALS--Continued						
Titanium:						
Dioxide		270,272	256,961	240,469	253,453	253,364
Metal		19,457	24,906	25,199	18,923	23,500 e
Tungsten, metal		4,993	3,607	3,302	3,333	4,166
Vanadium, metal[e, 6]		890 r	890 r	1,000 r	1,000 r	1,000
Zinc:						
Mine output, Zn content		63,601	44,519	42,851	44,574	47,781
Oxide		82,816	75,414	74,515	75,090	75,813
Metal:						
Primary		541,704	541,277	547,183	532,704	534,830
Secondary		157,047	142,777	126,723	153,411	132,417
Total		698,751	684,054	673,906	686,115	667,247
Zirconium, oxide		8,540	7,930	8,650	8,800	9,800
INDUSTRIAL MINERALS						
Asbestos[e]		-- r	-- r	-- r	-- r	--
Bromine[e]		15,000	15,000	20,000	20,000	20,000
Cement, hydraulic	thousand metric tons	81,097	76,550	71,828	68,766	67,376
Clays:						
Bentonite		415,115	415,102 r	437,772	425,945	455,282
Fire clay, crude		506,314	475,665	480,000 e	460,000 e	470,000 e
Kaolin		25,739	17,240 r	11,756	12,409	11,553
Diatomite		136,400 r	132,100 r	111,190 r	129,300 r	130,000 e
Feldspar and related materials:[e]						
Feldspar		52,000	50,000	50,000	50,000	50,000
Aplite		330,000	310,000	403,000	300,000	310,000
Gypsum	thousand metric tons	5,917	5,874	5,644	5,764	5,865
Iodine		6,157	6,643	6,548	6,524	7,264
Lime, quicklime	thousand metric tons	8,106	7,586	7,420	7,953	8,507
Nitrogen, N content of ammonia	do.	1,410	1,318	1,192	1,061	1,101
Perlite[e]		250,000	255,000	250,000	250,000	200,000
Salt, all types	thousand metric tons	1,374	1,358	1,282	1,263	1,225
Silica:						
Sand	do.	6,121	5,768	4,893	4,699	4,705
Stone, quartzite	do.	15,578	14,213	13,568	12,838	12,218
Sodium compounds, n.e.s.:						
Soda ash		669,203	461,204	410,000	400,000	400,000
Sulfate, anhydrous		163,057	146,780	137,713	132,807	130,107
Stone, crushed:						
Dolomite	thousand metric tons	3,539	3,389	3,450	3,579	3,727
Limestone	do.	185,569	182,255	170,166	163,565	161,858
Sulfur:						
S content of pyrite	do.	-- r	-- r	-- r	-- r	--
Byproduct of metallurgy	do.	1,384	1,319	1,326	1,281	1,263
Byproduct of petroleum	do.	2,071	2,024	1,865	1,951	1,895
Talc and related materials:						
Talc[e]		50,000	45,000	40,000	40,000	42,000
Pyrophyllite		692,998	623,097	600,000 e	600,000 e	610,000 e
Vermiculite[e]		7,000 r	6,500 r	6,400 r	6,200 r	6,200

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand metric tons	788	742	755	788	804
Coal, bituminous[7]	do.	3,126	3,208 r	1,368 r	1,338 r	1,339
Coke including breeze:						
Metallurgical	do.	38,394	38,402	38,417	38,544	38,314
Gas, natural:						
Gross[8]	million cubic meters	2,453	2,521	2,571	2,844	2,883
Marketed	do.	2,507	2,602	2,662	3,011	3,021
Petroleum:						
Crude	thousand 42-gallon barrels	4,656	4,782	4,548	5,161	5,247
Refinery products:						
Gasoline:						
Aviation[e]	do.	45	40	40	50	50
Other	do.	356,530	364,714	364,129	367,687	366,662
Asphalt and bitumen	do.	33,366	33,151	31,537	32,586	34,475
Distillate fuel oil	do.	268,022	261,851	250,932	242,311	243,425
Jet fuel	do.	66,828	67,320	65,263	60,013	64,846
Kerosene	do.	175,399	176,655	169,472	177,963	167,348
Liquefied petroleum gas	do.	57,251	59,942	53,593	53,107	50,881
Lubricants	do.	16,677	16,304	16,630	16,314	16,561
Naphtha	do.	112,935	116,122	119,298	122,355	125,252
Paraffin, wax	do.	855	822	833	915	902
Petroleum coke	do.	4,274	4,700	4,549	4,000	4,533
Refinery fuel and losses[e, 9]	do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil	do.	429,153	409,780	398,673	435,763	406,901
Unfinished oils[e]	do.	50,000	50,000	50,000	50,000	50,000
Total[10]	do.	1,720,000	1,710,000	1,670,000	1,710,000	1,680,000

[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 28, 2005.

[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]All major coal mines had closed by January 2002, but 12 smaller mines were still in operation in 2004.

[8]Includes output from gas wells and coal mines.

[9]May include some additional unfinished oils.

[10]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, 2004; Yearbook of Chemical Industries Statistics, 2004; Yearbook of Ceramics and Building Materials Statistics, 2004; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2004. Japan Aluminum Association, Aluminum Statistics, 2004. Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Review No. 121, 2005. U.S. Geological Survey Minerals Questionnaire, 2000-04.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(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 Precture	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 & Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	218,400
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Nippon Mining & Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture; Saganoseki, Oita Prefecture	452,400
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd., 4.17%; Mitsubushi Materials Corp., 49.29%; Mitsubishi Cable Indutries, Ltd., 4.17%; others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi/Toyo (Saijyo), Ehime Prefecture	300,000
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 & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining & 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 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
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
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.	Nippoh 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 & Metals Co. Ltd.)[2]	Toyoha, Hokkaido Prefecture	6
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining & 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.)	Hosokura, Miyagi Prefecture	22,200
Manganese, electrolytic dioxide		Mitsui Mining & Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	32
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.	Nippon Yakin Kogyo 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 2004

(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	18
Do.		Toho Titanium Co. Ltd. (Nippon Mining & Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; others, 33%)	Chigasaki, Kanagawa Prefecture	13
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.	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	13,200
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
Do.	do.	Tohkem Products Corp.	Akita, Akita Prefecture	30,000
Zinc:				
In concentrate		Toyoha Mining Co. Ltd.[2]	Toyoha, Hokkaido Prefecture	48
Refined	metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining & 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 & Smelting Co. Ltd., 57.7%; Nippon Mining & Metals Co. Ltd., 27.8%; and 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.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITES IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Coal[1]		785,000
Copper ore, Cu content		36
Dolomite[2]		1,400,000
Gold ore, Au content	kilograms	179,000
Iodine		5,000 [e]
Lead ore, Pb content		623
Kaolin		35,000
Limestone[3]		60,700,000
Pyrophyllite		160,000
Silica sand[4]		201,000
Silica stone, white[5]		881,000
Silver ore, Ag content		2,390
Zinc ore, Zn content		3,250

[e]Estimated.
[1]Recoverable reserves, which include 17 million metric tons of lignite.
[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.

Sources: Research Institute of Economy, Trade and Industry.

TABLE 4
JAPAN: MINERALS TRADE[1]

(Million dollars)

Code	Commodity	Imports			Exports		
		2002	2003	2004	2002	2003	2004
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,176	1,220	1,391	301	374	399
26	Ferrous and nonferrous metal ores, slag, ash	6,511	7,482	10,221	30	40	70
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral waxes	65,664	81,054	99,421	1,403	1,555	2,287
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements, or of isotopes	2,942	3,458	4,339	1,934	2,292	2,706
31	Fertilizers	526	530	641	84	86	103
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials	1,085	1,150	1,168	855	1,016	1,251
69	Ceramic products	647	760	880	860	912	1,089
70	Glass and glassware	1,202	1,362	1,752	2,413	2,788	3,456
71	Natural or cultured pearls; precious or semi-precious stones; precious metals, metals clad with precious metals and articles thereof; imitation jewellery; coins	5,698	5,705	7,685	1,636	2,149	2,491
72	Iron and steel	2,185	3,093	5,258	13,160	15,717	21,187
73	Articles of iron and steel	2,455	2,852	3,524	5,821	6,225	7,678
74	Copper and articles thereof	692	761	1,196	2,270	2,388	3,199
75	Nickel and articles thereof	927	1,384	2,187	324	458	786
76	Aluminum and articles thereof	4,533	5,447	6,592	1,434	1,722	1,965
78	Lead and articles thereof	19	18	26	20	18	27
79	Zinc and articles thereof	41	63	78	107	89	105
80	Tin and articles thereof	113	156	297	53	56	85
81	Other base metals, cermets, articles thereof	622	840	1,685	540	643	859
	Total	97,038	117,335	148,341	33,245	38,528	49,743
	Total trade	337,550	382,761	454,867	416,538	470,650	565,342

[1]Values have been converted from Japanese yen (¥) to U.S. dollars (US$) at a rate of ¥125.1=US$1.00 for 2002, ¥115.9=US$1.00 for 2003, and ¥108.2=US$1.00 for 2004.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 2002-2004.

TABLE 5
JAPAN: OVERSEAS ALUMINUM SMELTING PROJECTS, AN UPDATE IN 2004

Company/project name and country	Annual capacity (metric tons) Total	Japanese share	Type of power	Production started	Shipment to Japan started	Major equity holder and/or other holders	Participating Japanese companies and their equity share
New Zealand Aluminium Smelters Ltd., New Zealand	313,000	67,600	Hydro	April 1971	July 1971	Comalco New Zealand Ltd., 79.36%	Sumitomo Chemical Co. Ltd., 20.64%.
Alcan Smelters and Chemical Ltd., Canada	90,000	45,000	do.	NA	January 1977	Alcan Aluminum Ltd. of Canada, 50%	Nippon Light Metal Co. Ltd., 50%.
Intalco Aluminum Corp.[1] United States	272,000	106,000	do.	1966	NA	Alcoa Inc., 61%	Mitsui & Co., Ltd., 32%, and YKK Corp., 7%.
Eastalco Aluminum Co.,[1] United States	174,000	68,000	Thermal	1970	do.	do.	do.
Industria Venezolana de Aluminio C.A., Venezuela	450,000	90,000	Hydro	February 1978	December 1978	Corp. Venezolana de Guayana (CVG), of Venezuela, 80%	Showa Denko K.K., 7%; Sumitomo Chemical Co. Ltd., 4%; Kobe Steel Ltd., 4%; Mitsubishi Materials Corp., 3%; Mitsubishi Aluminum Co. Ltd., 1%; Marubeni Corp., 1%.
P.T. Indonesia Asahan Aluminum, Indonesia	225,000	133,000	do.	February 1982	October 1982	Indonesian Government, 41%	Nippon Asahan Aluminium Co. Ltd. (a 13-member Japanese consortium), 59%.
Boyne Island Smelter Ltd., reduction lines 1, 2, Australia	260,000	130,000	Thermal	do.	July 1982	Comalco Ltd. of Australia, 59.5%	Sumitomo Light Metal Co. Ltd., 17%; Ryowa Development Pty. Ltd., 9.5%; YKK Aluminum Pty. Ltd., 9.5%; Sumitomo Chemical Co. Ltd., 4.5%.
Boyne Island Smelter Ltd., reduction line 3, Australia	230,000	94,000	do.	July 1997	October 1997	Comalco Ltd. of Australia, 59.25%	Sumitomo Light Metal No. 2 Co. Pty. Ltd., 17%; Ryowa Development II Pty. Ltd., 14.25%; YKK Aluminium Pty. Ltd., 9.5%.
Alcoa of Australia Ltd., Australia	350,000	80,500	do.	November 1986	NA	Alcoa of Australia, 45%; Eastern Aluminum Co., 10%; China International Trust & Investment Corp., 22%	Marubeni Corp., 23%.
Aluminio Brasileiro S.A., Brazil	400,000	196,000	Hydro	July 1985	November 1986	Companhia Vale do Rio Doce, 51%	Nippon Amazon Aluminum Co. (a 32-member Japanese consortium), 49%.
Mozambique Aluminum Co.,[2] Mozambique	503,000	126,000	do.	June 2000	NA	Billiton plc, 47.11%; Industrial Development Corp. of South Africa, 24.04%; the Government of Mozambique, 3.85%	Mitsubishi Corp., 25%.
Aluminerie Alouette Inc.,[3] Canada	243,000	46,000	do.	June 1992	September 1992	Alcan, 40%; Austria Metal AG, 20%; Hydro Aluminium, 20%; Societe Generale de Financement du Quebec, 13.33%	Marubeni Corp., 6.67%.

NA not available.

[1]The two smelters under Intalco Aluminum Corp. and Eastalco Aluminum Co. were acquired by Alcoa Inc. in July 1998.

[2]Phase 2 was compelted and added an additional 253,000 metric tons per year (t/yr) of aluminum capacity in October 2003.

[3]Capacity will be expanded to 500,000 t/yr in fall 2005 from 243,000 t/yr.

Source: Japan Aluminum Association, Japan Overseas Aluminun Smelting Projects; U.S. Geological Survey, Primary Aluminum Plants Worldwide—1998, Part I—Detail, p. 4, 22, and 155; Marubeni Corp.

TABLE 6
JAPAN: DEMAND FOR GOLD AND SILVER

Item		2000	2001	2002	2003	2004
Gold:						
Dental and medical	kilograms	21,221	20,813	21,765	22,373	21,383
Electrical, electronic, and communication	do.	106,086	70,916	80,415	85,112	86,315
Gold plating	do.	24,993	22,615	22,513	23,512	23,612
Jewelry	do.	43,119	37,512	37,128	20,489	20,189
Decorations and badges	do.	1,678	1,474	1,392	1,499	1,412
Pottery and porcelain	do.	1,005	975	1,149	1,532	1,420
Fountain pens	do.	12	14	15	15	--
Watches	do.	768	778	785	790	786
Industrial arts and crafts	do.	4,222	4,893	4,697	4,879	4,653
Private hoarding	do.	52,417	69,586	85,569	79,481	80,526
Other	do.	39,257	32,919	47,755	48,317	48,180
Total	do.	294,778	262,495	303,183	287,999	289,598
Silver:						
Silver nitrate for photography	metric tons	1,726	1,663	1,532	1,365	1,243
Silver nitrate for other uses	do.	335	150	220	295	307
Electrical contacts	do.	313	202	153	219	260
Brazing alloy	do.	139	111	98	95	105
Rolled products	do.	298	193	216	228	248
Other	do.	1,215	636	455	474	434
Total	do.	4,026	2,955	2,674	2,676	2,597

-- Zero.

Source: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, Nos. 119, 120, and 121; Ministry of Economy, Trade and Industry, Yearbook of Iron and Steel, Nonferrous Metals, and Fabricated Metals Statistics, 2004, p. 288.

TABLE 7
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	2000	2001	2002	2003	2004
Automobiles:					
Ordinary steel	9,310	9,430	10,310	10,580	10,760
Specialty steel	2,660	2,590	2,990	3,230	3,640
Total	11,970	12,020	13,300	13,810	14,400
Construction:					
Ordinary steel	14,060	13,550	13,580	13,300	13,380
Specialty steel	780	720	640	710	720
Total	14,840	14,270	14,220	14,010	14,100
Conversion and processing:					
Ordinary steel	3,090	2,910	2,790	2,760	2,800
Specialty steel	3,400	3,260	3,560	3,880	4,340
Total	6,490	6,170	6,350	6,640	7,140
Electric machinery and equipment:					
Ordinary steel	2,190	1,940	1,840	1,940	2,030
Specialty steel	140	130	130	160	180
Total	2,330	2,070	1,970	2,100	2,210
Home and office appliances:					
Ordinary steel	610	550	540	580	610
Specialty steel	200	210	200	200	190
Total	810	760	740	780	800
Industrial machinery and equipment:					
Ordinary steel	1,330	1,290	1,360	1,650	1,920
Specialty steel	1,070	940	980	1,180	1,390
Total	2,400	2,230	2,340	3,830	3,310
Shipbuilding and marine equipment:					
Ordinary steel	3,130	3,480	3,420	3,530	4,290
Specialty steel	120	140	180	210	140
Total	3,250	3,620	3,600	3,740	4,430
Steel dealers:					
Ordinary steel	20,030	17,930	17,480	17,070	17,400
Specialty steel	1,280	1,230	1,210	1,350	1,470
Total	21,310	19,160	18,690	18,420	18,870
Tanks and containers:					
Ordinary steel	1,740	1,620	1,560	1,600	1,600
Specialty steel	20	20	20	20	30
Total	1,760	1,640	1,580	1,620	1,630
Other:					
Ordinary steel	610	570	500	410	430
Specialty steel	110	110	110	120	140
Total	720	680	610	530	570
Total domestic demand:					
Ordinary steel	56,100	53,270	53,380	53,420	55,220
Specialty steel	9,780	9,350	10,020	11,060	12,240
Grand total	65,880	62,620	63,400	64,480	67,460

Source: The Steel Industry of Japan 2003-2005, The Japan Iron and Steel Federation.

TABLE 8
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY PRINCIPAL DESTINATION

(Thousand metric tons)

Destinations	2000	%	2001	%	2002	%	2003	%	2004	%
China	4,062	13.9	4,566	15.0	6,532	18.0	6,435	18.7	6,890	19.5
Korea, Republic of	6,029	20.7	6,537	21.5	9,198	25.3	8,978	26.1	8,950	25.4
Taiwan	2,557	8.8	2,528	8.3	3,263	9.0	3,280	9.5	3,240	9.2
Thailand	2,793	9.6	2,572	8.4	3,350	9.2	3,593	10.4	3,860	10.9
Middle East	1,090	3.7	1,523	5.0	1,074	3.0	1,172	3.4	990	2.8
Europe	854	2.9	1,193	3.9	715	2.0	742	2.2	1,090	3.1
United States	2,137	7.3	2,206	7.2	1,485	4.1	1,076	3.1	1,410	4.0
All other countries	9,639	33.1	9,353	30.7	10,706	29.4	9,135	26.6	8,872	25.1
Grand total	29,161	100.0	30,478	100.0	36,323	100.0	34,411	100.0	35,302	100.0

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

TABLE 9

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2004

	Australia		Canada	
	McArthur River, Northern Territory	Northparkes, New South Wales	British Columbia Mount Polley[1]	British Columbia Huckleberry
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan.
Participating Japanese companies and their equity share	Nippon Mining & Metals Co. Ltd., 16.67%; Mitsui & Co. Ltd., and Marubeni Corp., 4.165% each	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	Mount Isa Mines Ltd. of Australia, 75%	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 100%[1]	Princeton Mining Corp. of Canada, 50%.
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold	Copper.
Estimated reserves and ore grade	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	Underground	Open pit and underground	Open pit	Open pit.
Total cost of the project	$296 million (Australian)	$303 million (Australian)	$123 million (Canadian)	$136 million (Canadian).
Japanese share	$29 million (Australian)	$75.6 million (Australian)	$109 millon (Canadian)	$78 million (Canadian).
Annual production capacity	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 ton gold	6,500,000 metric tons of crude ore	7,145,600 metric tons of crude ore contining 0.502% copper, 0.013% molybdenum.
Annual shipment to Japan	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	August 1993	May 1993	September 1996	1996.
Production started or planned	September 1995	October 1995	June 1997	October 1997.

	Chile			
		Region III		
	Collahuasi, Region I	La Candelaria	Atacama Kozan	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.
Participating Japanese companies and their equity share	Mitsui & Co. Ltd., 7.4%; Mitsui Mining & Smelting Co. Ltd., 1.0%; Nippon Mining & Metals Co., Ltd., 3.6%	Sumitomo Metal Mining Co. Ltd., 16% and Sumitomo Corp., 4%	Nittetsu Mining Co. Ltd., 60%	Nippon Mining & Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui & 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%	Antofagasta plc of the United Kingdom, 60%.
Mineral commodity involved	Copper	Copper and gold	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	2,074 million metric tons, 0.65% copper.
Type of mine	Open pit	Open pit	Underground	Open pit.
Total cost of the project	$1,760 million	$592 million	$111 million	$1,360 million.
Japanese share	$375 million	$296 million	$101 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	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	163,200 metric tons of copper in concentrate.
Construction started	1996	April 1993	May 1999	November 1997.
Production started or planned	January 1999	March 1995	June 2003	April 2000.

See footnotes at end of table.

TABLE 9--Continued
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECT OF NONFERROUS METALS MINES IN THE 1990s AND 2000s, AN UPDATE IN 2004

	Indonesia, Batu Hijau, Sumbawa Island	Mexico		Peru
		Tizapa, Mexico City	Rey de Plata, Guerrero	Antamina, Ancash
Nature of project involvement	Equity participation	Investment in exploration and development	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%	Mitsubishi 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%	Noranda Inc. of Canada and Billiton plc of the United Kingdom, 33.75% each; Teck Cominoco Ltd. of Canada, 22.5%.
Mineral commodity involved	Copper and gold	Copper, lead, and zinc	Copper, lead, and zinc	Copper 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	559 million metric tons, 1.23% copper, 1.03% zinc, and 0.03% molybdenum.
Type of mine	Open pit	Underground	Underground	Open pit.
Total cost of the project	$1,925 million	$38.2 million	$45.4 million	$2,296 million.
Japanese share	$513 million	$35.1 million	$41.3 million	$404 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	25,600,000 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	10,579 metric tons of copper in concentrate.
Construction started	September 1996	May 1992	January 1998	1998.
Production started or planned	October 1999	November 1994	October 2000	June 2001.
	Peru		The Philippines	United States
	Cerro Verde, Arequipa	Pallca, Ancash	Padcal, Luzon	Pogo, Alaska
Nature of project involvement	Equity participation (planned)	Equity participation	Long-term loan	Mine owned by Sumitomo Metal Mining Co. Ltd.
Participating Japanese companies and their equity share	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	Phelp Dodge Corp., 53.6%; Compania de Minas Buenaventura S.A.A., 18.2%; others, 7.2%	Mitsui Mining & Smelting Co. Ltd., 70%	Philex Mining Corp.	Sumitomo Metal Mining America Inc., 51%.
Mineral commodity invloved	Copper	Lead and zinc	Copper and gold	Gold.
Estimated reserves and ore grade	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, 0.78gram gold per metric ton	152 metric tons.
Type of mine	Open pit	Underground	Underground	Underground.
Total cost of the project	$850 million	$6.2 million	$15 million	$280 million.
Japanese share	About $265 million		$15 million	$168 million.
Annual production capcity	180,000 metric tons of copper in concentrate	170,000 metric tons of crude ore	70,000 metric tons of copper concentrate	12 metric tons of gold.
Annual shipment to Japan	Aproximately 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	Unknown	2005	December 2003	June 2004.
Production started or planned	The fourth quarter of 2006	November 2006	2006	March 2006.

[1]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, 2004, p. 190-193.

TABLE 10
JAPAN: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2003	2004	Destinations, 2004: United States	Destinations, 2004: Other, principal
METALS				
Alkali and alkaline-earth metals	285	196	17	China 25; Other Asia, nes 23; France 20.
Aluminum:				
Ore and concentrate	643	915	--	Republic of Korea 500; Other Asia, nes 400.
Oxides and hydroxides	290,948	285,508	3	Republic of Korea 127,642; China 53,542; Other Asia, nes 40,924.
Ash and residue containing aluminum	15,265	27,540	--	China 23,809; North Korea 2,614; Indonesia 540.
Metal, including alloys:				
Scrap	69,238	79,001	83	China 72,569; Hong Kong 3,118; Republic of Korea 1,592.
Unwrought	18,198	36,303	1,770	Thailand 17,695; Republic of Korea 5,972; China 3,343.
Semimanufactures, all forms	329,430	309,469	16,425	China 90,421; Thailand 42,644; Other Asia, nes 37,837.
Antimony:				
Ore and concentrate	2,979	904	--	All to China.
Oxides	2,320	2,578	115	China 497; Malaysia 346; Other Asia, nes 311.
Metal, including alloys, all forms[2]	888	464	1	Other Asia, nes 419; Malaysia 23; Thailand 13.
Arsenic, metal, including alloys, all forms	5	5	4	Mainly to United Kingdom.
Beryllium, metal, including alloys, all forms	89	8	1	Mainly to China.
Bismuth, metal, including alloys, all forms[2]	15	39	(3)	Hungary 13; United Kingdom 7; China 5.
Cadmium, metal, including alloys, all forms	1,215	1,411	138	China 1,168; Israel 104.
Chromium:				
Ore and concentrate	27,270	191	--	Other Asia, nes 159; Republic of Korea 29; Indonesia 3.
Oxides and hydroxides	5,143	6,032	1,181	Republic of Korea 2,579; Other Asia, nes 1,407; Thailand 169.
Metal, including alloys, all forms	644	907	428	Other Asia, nes 148; Republic of Korea 108; China 90.
Cobalt:				
Ore and concentrate	2	--	--	All to India.
Oxides and hydroxides	1,036	1,206	4	China 566; Republic of Korea 294; Other Asia, nes 138.
Metal, including alloys, all forms	2,396	2,095	215	China 683; Canada 565; Other Asia, nes 220.
Columbium and tantalum, tantalum metal, including alloys, all forms	423	445	100	Germany 138; Thailand 31; Israel 28.
Copper:				
Ore and concentrate	(3) r	(3)	--	
Matte, including cement copper	3,008	--	--	
Oxides and hydroxides	1,993	1,988	12	China 493; Malaysia 456; Republic of Korea 365.
Sulfate	3,833	4,325	16	Other Asia, nes 2,662; Hong Kong 614; Republic of Korea 515.
Metal, including alloys:				
Scrap	307,055	329,909	133	China 318,682; Hong Kong 5,810; Other Asia, nes 1,410.
Unwrought	331,241	227,785	6,485	Other Asia, nes 78,376; China 72,322; Republic of Korea 28,436.
Semimanufactures, all forms	286,647	308,680	17,801	China 57,158; Malaysia 43,284; Other Asia, nes 35,926.
Germanium, metal, including alloys, all forms	5	6	--	Mainly to China.
Gold, metal, including alloys, unwrought and partly wrought	101	90	(3)	Malaysia 23; Singapore 22; Other Asia, nes 18.
Iron and steel:				
Iron ore and concentrate	44,352 r	591	--	China 562; Republic of Korea 23; Other Asia, nes 6.
Metal:				
Scrap thousand metric tons	5,720	6,809	(3)	China 2,789; Republic of Korea 2,657; Other Asia, nes 930.
Pig iron, cast iron, related materials do.	158	86	2	Republic of Korea 46; Thailand 15; Other Asia, nes 5.
Ferroalloys:				
Ferrochromium	2,239	2,597	2,058	Thailand 338; India 120; Republic of Korea 30.
Ferromanganese	17,433	9,870	1,200	Other Asia, nes 4,193; Republic of Korea 1,307; Thailand 1,001.
Ferromolybdenum	27	43	(3)	Thailand 21; Malaysia 6; Singapore 6.
Ferronickel	101,598	111,024	--	Republic of Korea 60,583; Other Asia, nes 48,231; China 2,203.
Ferrosilicochromium	5	1,097	--	Republic of Korea 1,092; Hong Kong 3; China 2.
Ferrosilicomanganese	371	168	--	Other Asia, nes 142; Indonesia 26.
Ferrosilicon	6,994	7,391	14	Republic of Korea 2,499; Indonesia 1,924; Other Asia, nes 1,100.
Ferrotungsten	--	2	--	All to Thailand.
Silicon metal	515	902	34	China 336; Republic of Korea 279; Other Asia, nes 164.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2003	2004	Destinations, 2004: United States	Destinations, 2004: Other, principal
METALS--Continued					
Lead:					
Ore and concentrate		7	3	--	Mainly to China.
Oxides		757	618	10	Germany 218; Republic of Korea 200; Netherlands 96.
Metal, including alloys:					
Scrap		12,155	19,635	--	Republic of Korea 13,354; China 5,219; Malaysia 927.
Unwrought		17,178	19,401	--	China 13,618; Indonesia 1,978; Other Asia, nes 1,393.
Semimanufactures		876	1,140	6	Other Asia, nes 580; China 276; Republic of Korea 143.
Lithium:					
Oxide and hydroxide		12	17	(3)	China 10; Republic of Korea 3; United Kingdom 3.
Magnesium, metal, including alloys:					
Scrap		193	23	--	China 13; United Kingdom 6; Other Asia, nes 3.
Unwrought	ılue, thousands	$393 r	$657	$6	Other Asia, nes $524; Philippines $47; Hong Kong $34.
Semimanufactures		3,115	2,098	3	Other Asia, nes 1,262; China 801.
Manganese:					
Ore and concentrate		20	42,244	--	All to China.
Oxides		24,745	29,229	2,431	Indonesia 8.087; Singapore 5,484; China 3,713.
Metal, including alloys, all forms		311	261	(3)	Viet Nam 179; Thailand 26; Other Asia, nes 20.
Mercury		126	54	--	Netherlands 35; India 17; Viet Nam 1.
Molybdenum:					
Ore and concentrate:					
Roasted		27	2	--	All to Italy.
Unroasted	ılue, thousands	$310	$10	--	All to Singapore.
Oxides and hydroxides		18	132	3	Other Asia, nes 117; China 6; Indonesia 2.
Metal, including alloys, all forms		269	426	32	Other Asia, nes 173; Republic of Korea 114; Austria 18.
Nickel:					
Ore and concentrate	value, thousands	$73	$72	--	All to the Philippines.
Matte and speiss		27,916	32,682	(3)	Republic of Korea 16,791; Other Asia, nes 15,157; Netherlands 700.
Oxides and hydroxides		5,217	6,731	830	China 3,493; Other Asia, nes 756; Hong Kong 606.
Metal, including alloys:					
Scrap		648	400	177	United Kingdom 126; Other Asia, nes 60; Canada 12.
Unwrought		916	1,433	30	Hong Kong 848; Other Asia, nes 108; Indonesia 112.
Semimanufactures		11,766	15,915	393	Iran 3,077; China 1,970; Hong Kong 1,895.
Platinum-group metals:					
Metal, including alloys, unwrought and partly wrought:					
Palladium	value, thousands	$40	$52	$13	Austria $17; Republic of Korea $7; China $6.
Platinum	do.	$147	$144	$4	Hong Kong $96; Thailand $10.
Rhodium	do.	$3	$3	(3)	Mainly to Hong Kong.
Iridium, osmium, ruthenium	do.	$3	$2	(3)	Mainly to Germany.
Rare-earth, metal, including alloys, all forms		175	277	4	China 252; Hong Kong 20.
Selenium		570	539	4	China 272; Hong Kong 90; India 71.
Silicon		5,012	6,175	482	United Kingdom 1,665; China 955; Republic of Korea 955.
Silver, metal, including alloys, unwrought and partly wrought	value, thousands	$118	$181	$15	Other Asia, nes $52; Hong Kong $27; China $24.
Tin:					
Metal, including alloys:					
Scrap		681	600	--	Belgium 315; United Arab Emirates 247; Republic of Korea 23.
Unwrought		397	973	(3)	Philippines 234; Malaysia 197; China 126.
Semimanufactures		2,367	2,944	113	China 705; Other Asia, nes 345; Malaysia 156.
Titanium:					
Ore and concentrate		39	84	--	Other Asia, nes 79; Viet Nam 4.
Oxides		28,637	31,058	1,522	China 12,846; Other Asia, nes 8,359; Republic of Korea 2,669.
Metal, including alloys, all forms		17,965	10,680	821	Republic of Korea 1,368; China 1,366; Sweden 1,332.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2003	2004	Destinations, 2004: United States	Destinations, 2004: Other, principal
METALS--Continued					
Tungsten:					
Ore and concentrate		--	533	--	Mainly to China.
Metal, including alloys, all forms		1,757	2,287	325	Other Asia, nes 428; China 417; Thailand 86.
Uranium and thorium, metal, including alloys, all forms		7	1	1	
Vanadium:					
Oxides and hydroxides		248	221	1	Republic of Korea 176; Other Asia, nes 21; China 9.
Metal, including alloys, all forms		54	32	--	Mainly to Other Asia, nes.
Zinc:					
Ore and concentrate		119	3,013	--	Republic of Korea 2,983; Hong Kong 30.
Oxides		2,051	2,416	149	Thailand 456; Turkey 440; Other Asia, nes 197.
Blue powder		3	10	--	Republic of Korea 6; Singapore 4.
Ash and residue containing zinc		1,275	2,379	--	China 1,166; Republic of Korea 924; Other Asia, nes 242.
Metal, including alloys:					
Scrap		4,194	3,617	--	China 2,841; Other Asia, nes 534; Hong Kong 214.
Unwrought		77,661	76,188	2	Other Asia, nes 22,066; Indonesia 17,249; Philippines 10,745.
Semimanufactures		3,347 r	3,343	20	China 1,115; Singapore 298; India 188.
Zirconium:					
Ore and concentrate		585	1,143	1	China 790; Malaysia 177; Philippines 139.
Metal, including alloys, all forms		26	50	1	Canada 35; Republic of Korea 4; Other Asia, nes 3.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		22,423	28,873	15	Republic of Korea 12,895; China 9,858; Other Asia, nes 2,289.
Artificial:					
Corundum		22,944	22,202	1,958	Other Asia, nes 4,077; China 3,207; Thailand 1,834.
Silicon carbide		9,562	9,123	1,250	Republic of Korea 3,398; Other Asia, nes 1,759; Thailand 767.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$180	$251	$182	Hong Kong $41; Republic of Korea $13; China $10.
Grinding and polishing wheels and stones		8,700	10,381	1,281	Indonesia 2,042; Republic of Korea 1,266; Thailand 853.
Asbestos, crude	value, thousands	$25 r	$4	--	All to Hong Kong.
Barite and witherite	do.	$42 r	$27	--	Viet Nam $18; France $7; Indonesia $2.
Boron materials:					
Crude natural borates	do.	$24 r	$61	--	Singapore $35; China $26.
Oxides and acids		461	343	24	Other Asia, nes 116; Republic of Korea 76; Malaysia 60.
		9,734	10,313	2	China 2,114; Hong Kong 2,113; Singapore 1,420.
Chalk		2,221	1,921	--	Republic of Korea 1,196; Indonesia 306; Other Asia, nes 285.
Clays, crude:					
Bentonite		2,291	2,814	6	Thailand 1,265; Indonesia 873; Singapore 294.
Chamotte or dinas earth		45	54	--	All to Republic of Korea.
Fire clay		3,440	3,175	--	Other Asia, nes 846; Republic of Korea 599; Thailand 421.
Fuller's earth		--	2	--	All to Singapore.
Kaolin		8,397	4,731	64	China 1,706; Other Asia, nes 1,344; Hong Kong 465.
Unspecified		19,220 r	22,290	25	Indonesia 5,626; China 4,772; Malaysia 2,455.
Diamond, natural:					
Gem, not set or strung	value, thousands	$13,061	$27,810	$3,428	Hong Kong $14,572; Italy $5,252.
Industrial stones	do.	$1,887	$2,908	$200	Thailand $1,239; Belgium $31; China $24.
Dust and powder	do.	$7,816	$7,970	$4,839	Republic of Korea $916; Philippines $610; China $594.
Diatomite and other infusorial earth		2,140	3,673	825	Viet Nam 729; Other Asia, nes 717; Republic of Korea 422.
Feldspar		4,034	2,466	--	Other Asia, nes 1,443; Thailand 638; Hong Kong 217.
Fluorspar	value, thousands	$404	$457	--	Germany $157; Singapore $139; Thailand $72.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		2003	2004	Destinations, 2004: United States	Destinations, 2004: Other, principal
INDUSTRIAL MINERALS--Continued					
Fertilizer materials:					
Crude, n.e.s.		6,823	10,653	1	China 7,575; Republic of Korea 1,008; Malaysia 595.
Manufactured:					
Ammonia		4,962	6,669	1,061	Other Asia, nes 2,520; Singapore 1,219; China 757.
Nitrogenous		887,465	869,615	1,289	Malaysia 340,710; Philippines 260,796; Viet Nam 234,308.
Phosphatic		3,345	400	50	Republic of Korea 126; Other Asia, nes 96; China 79.
Potassic		209	444	220	China 102; Republic of Korea 64; Other Asia, nes 33.
Graphite, natural		1,427	1,579	262	Republic of Korea 405; Other Asia, nes 169; China 131.
Gypsum and plaster		4,569	4,267	46	Bangladesh 1,121; Republic of Korea 1,058; Other Asia, nes 540.
Iodine		5,229	5,211	1,559	France 611; United Kingdom 558; Italy 536.
Kyanite and related materials, mullite and unspecified		2,480	3,870	18	Republic of Korea 2,921; Sri Lanka 700; Other Asia, nes 320.
Lime		4,485	4,378	230	Other Asia, nes 1,539; Singapore 825; Republic of Korea 562.
Magnesium compounds:					
Magnesite, crude		49	90	--	Republic of Korea 35; Other Asia, nes 30; Indonesia 16.
Oxides and hydroxides		50,930	48,499	5,454	Republic of Korea 17,755; Other Asia, nes 8,362; China 4,622.
Mica:					
Crude including splittings and waste		1,137	1,377	311	Thailand 461; China 144; Republic of Korea 142.
Worked including agglomerated splittings		1,676	1,883	12	China 868; Austria 599; Other Asia, nes 102.
Nitrates, crude		794	1,628	--	Indonesia 1,506; Thailand 101; Philippines 16.
Phosphates, crude		25	9	--	Viet Nam 7; Denmark 2.
Phosphorus, elemental		31	31	1	Republic of Korea 25; China 1; Russia 1.
Pigments, mineral, iron oxides and hydroxides processed		50,709	43,306	5,606	China 20,682; Thailand 4,506; Other Asia, nes 1,273.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$5,971	$8,589	$735	Other Asia, nes $4,385; Hong Kong $1,792; Thailand $735.
Synthetic	do.	$40,644	$51,925	$8,280	China $8,568; Hong Kong $6,631; Thailand $3,696.
Pyrite, unroasted		42	18	--	New Zealand 13; Republic of Korea 5.
Quartz crystal, piezoelectric	value, thousands	$38,136	$41,682	$4,092	Singapore $11,788; Hong Kong $5,647; Malaysia $5,476.
Salt and brine		1,148	1,562	62	China 413; Republic of Korea 182; Singapore 166.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		32,833	37,259	11	China 37,199; Republic of Korea 46.
Worked	value, thousands	$1,749	$2,144	$789	China $495; Republic of Korea $266; Other Asia, nes $248.
Dolomite, chiefly refractory-grade		198	799	27	Other Asia, nes 760; Malaysia 9; United Kingdom 3.
Gravel and crushed rock		5,120	6,301	2	Republic of Korea 4,006; Other Asia, nes 1,131.
Limestone other than dimension	thousand metric tons	2,508	2,994	--	Other Asia, nes 1,869; Australia 574; Republic of Korea 545.
Quartz and quartzite		2,218	4,237	66	Singapore 1,460; Republic of Korea 1,360; France 647.
Sand other than metal-bearing and sand and gravel		13,296	18,804	208	Republic of Korea 8,486; Other Asia, nes 3,467; China 2,307.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand metric tons	1,179	1,160	--	China 793; Republic of Korea 140; Indonesia 119.
Colloidal, precipitated, sublimed		1,065	1,993	968	Mexico 280; Indonesia 234; Republic of Korea 129.
Dioxide		7	2	(3)	Mainly to Other Asia, nes.
Sulfuric acid	thousand metric tons	1,240	1,158	1	China 626; Other Asia, nes 220; Chile 109.
Talc, steatite, soapstone, pyrophyllite		7,786	10,229	363	China 1,727; Hong Kong 1,686; Singapore 1,418.
Vermiculite, perlite, chlorite		23,386	20,194	71	Other Asia, nes 2,477; Republic of Korea 16,105; China 1,452.
Other: Slag and dross, not metal-bearing	thousand metric tons	5,766	7,704	329	Other Asia, nes 2,634; Republic of Korea 1,400; United Arab Emirates 840.

[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 11
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Sources, 2004: United States	Sources, 2004: Other, principal
METALS					
Alkali and alkaline-earth metals		603	648	125	France 452; China 290; Russia 16.
Aluminum:					
Ore and concentrate		2,010,520	1,945,759	--	Australia 1,040,397; Indonesia 690,605; India 158,961.
Oxides and hydroxides		80,621	120,981	7,381	Australia 85,625; China 11,253; Republic of Korea 9,588.
Ash and residue		2,359	8,710	--	Republic of Korea 4,724; Thailand 3,058; China 788.
Metal, including alloys:					
Scrap		113,495	105,681	28,748	Arabia 11,486; United Kingdom 10,784; Australia 7,194.
Unwrought	thousand metric tons	2,941	3,021	7	Russia 772; Australia 554; China 324.
Semimanufactures		63,036	90,777	11,677	Bahrain 54,638; Republic of Korea 31,664; Germany 7,802.
Antimony:					
Ore and concentrate		--	10	--	All from China.
Oxides		7,324	7,977	43	China 7,077; Mexico 478; Other Asia, nes 308.
Metal, including alloys, all forms		7,274	8,176	--	Mainly from Other Asia, nes.
Arsenic, metal, including alloys, all forms		42	20	--	Mainly from China.
Beryllium, metal, including alloys, all forms		2	7	1	Mainly from Thailand.
Bismuth		780	935	13	China 565; Peru 227; Belgium 67.
Cadmium, metal, including alloys, all forms		3,917	2,668	(2)	Republic of Korea 940; Canada 504; Peru 374.
Chromium:					
Ore and concentrate		184,662	271,284	100	India 161,484; South Africa 68,689; Philippines 13,055.
Oxides and hydroxides		4,843	4,196	141	China 2,249; Kazakhstan 960; United Kingdom 438.
Metal, including alloys, all forms		3,917 r	2,668	--	Republic of Korea 940; Canada 504; Peru 374.
Cobalt:					
Ore and concentrate		11	10	--	All from China.
Oxides and hydroxides		3,510	2,626	93	Belgium 1,611; Finland 574; Other Asia, nes 152.
Metal, including alloys, all forms		12,688	15,181	330	Finland 3,931; Australia 3,360; Canada 2,309.
Columbium and tantalum, tantalum metal, including alloys, all forms		301	263	80	Thailand 93; China 28; Germany 17.
Copper:					
Ore and concentrate	thousand metric tons	4,106	4,457	10	Chile 2,255; Indonesia 619; Australia 421.
Matte including cement copper		1,988	15,046	--	Chile 11,514; Australia 1,613; Viet Nam 822.
Oxides and hydroxides		2,469	2,618	1,622	Malaysia 260; Australia 210; Viet Nam 216.
Sulfate		1,185	1,798	22	China 1,256; Thailand 200; Republic of Korea 180.
Ash and residue containing copper		2,726	6,772	4,894	Malaysia 1,416; Indonesia 405; Philippines 57.
Metal, including alloys:					
Scrap		121,498	145,102	27,083	Philippines 22,096; Singapore 17,570; Malaysia 17,307.
Unwrought		85,401	97,677	1,164	Chile 54,588; Peru 11,629; Republic of Korea 10,318.
Semimanufactures		64,735	82,724	2,715	Republic of Korea 21,631; China 16,563; Malaysia 14,514.
Germanium, metal, including alloys, all forms		11	9	(2)	China 7; Belgium 2.
Gold, metal, including alloys, unwrought and partly wrought		49 r	80	9	Switzerland 34; Australia 11; Hong Kong 9.
Iron and steel:					
Iron ores and concentrates	thousand metric tons	132,082	134,884	(2)	Australia 85,441; Brazil 23,953; India 12,139.
Metal:					
Scrap	do.	240 r	261	46	Republic of Korea 83; Other Asia, nes 64; Thailand 12.
Pig iron, cast iron, related materials		642,860 r	693,736	8,008	China 358,092; Brazil 109,131; India 51,764.
Ferroalloys:					
Ferrochromium		913,593	977,219	(2)	South Africa 524,903; Kazakhstan 232,682; Zimbabwe 70,023.
Ferromanganese		87,308	51,204	--	Australia 18,098; China 15,823; South Africa 9,745.
Ferromolybdenum		5,121	5,066	--	China 4,682; Chile 308; Republic of Korea 36.
Ferronickel		56,947	55,602	--	New Caldonia 36,757; Colombia 8,425; Dominican Republic 7,558.
Ferrosilicochromium		1,220	4,230	--	All from China.
Ferrosilicomanganese		283,113	300,452	--	China 196,065; Ukraine 33,041; India 25,492.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	2003	2004	Sources, 2004: United States	Sources, 2004: Other, principal
METALS--Continued				
Iron and steel--Continued				
Metal--Continued				
Ferroalloys--Continued				
Ferrosilicon	510,398	562,840	2	China 401,217; Russia 6; Brazil 64.
Ferrotungsten	1,307	1,329	--	All from China.
Silicon metal	215,269	242,442	32	China 201,796; Norway 17,312; Australia 7,412.
Lead:				
Ore and concentrate	184,485	140,716	73,408	Australia 37,739; Bolivia 12,444; Russia 11,750.
Oxides	24,836	21,802	27	China 10,280; Other Asia, nes 6,373; Mexico 2,700.
Metal, including alloys:				
Unwrought	15,160	14,811	9	China 12,543; Peru 1,237; Mexico 904.
Semimanufactures	2,238	2,106	2	China 1,040; France 877; Germany 128.
Lithium, oxides and hydroxides	1,457	1,497	1,211	China 194; Russia 89; Other Asia, nes 2.
Magnesium, metal, including alloys:				
Scrap	1,921	1,620	--	Other Asia, nes 999; China 600; Malaysia 20.
Unwrought	40,434	42,130	35	China 39,459; Canada 1,611; Norway 892.
Semimanufactures	7,075	10,272	205	China 1,088; Russia 514.
Manganese:				
Ore and concentrate	1,192	1,259	--	South Africa 764; Australia 390; Ghana 54.
Oxides and dioxides	3,911	10,441	4	China 5,813; South Africa 2,935; Belgium 986.
Metal, including alloys, all forms	64,184	83,338	795	China 73,700; South Africa 8,617; United Kingdom 170.
Mercury	5	3	(2)	Mainly from Spain.
Molybdenum:				
Ore and concentrate:				
Roasted	32,727	19,774	2,058	Chile 19,774; Mexico 4,951; Canada 3,413.
Unroasted	39	110	73	Mainly from Mongolia.
Oxides and hydroxides	809	2,473	713	Chile 788; China 425; Uzbekistan 324.
Metal, including alloys, all forms	865	1,010	192	Austria 361; China 306; Other Asia, nes 97.
Nickel:				
Ore and concentrate thousand metric tons	4,208	4,513	--	Indonesia 2,331; Philippines 1,100; New Caldonia 1,081.
Matte	121,240	128,599	--	Indonesia 94,358; Australia 34,134; Cuba 84.
Oxides and hydroxides	163	258	16	Canada 187; Finland 36; Germany 20.
Metal, including alloys:				
Scrap	10,664	9,434	1,996	Netherlands 1,914; Russia 1,426; Republic of Korea 1,341.
Unwrought	54,527	52,562	34	Russia 10,099; South Africa 7,369; China 6,729.
Semimanufactures	9,769	12,782	1,214	Canada 4,910; United Kingdom 4,815; Germany 817.
Platinum-group metals:				
Metal, including alloys, unwrought and partly wrought:				
Palladium value, thousands	$392	$482	$58	Russia $146; United Kingdom $64; Switzerland $40.
Platinum do.	$1,111	$1,712	$74	South Africa $1,232; Russia $176; United Kingdom $74.
Rhodium do.	$125	$224	$10	South Africa $147; Russia $33; United Kingdom $18.
Iridium, osmium, ruthenium do.	$18	$31	$2	South Africa $26; Russia $1; United Kingdom $1.
Rare-earth metals, including alloys, all forms	6,119	6,379	(2)	China 6,376; Other Asia, nes 2.
Selenium	15	13	(2)	Belgium 6; Philippines 6.
Silicon, high-purity	8,085	10,981	6,334	United Kingdom 1,679; Germany 1,341; China 997.
Silver:				
Ore and concentrate	11,470	13,202	--	Chile 10,824; Peru 2,378.
Metal including alloys, unwrought and partly wrought:	1,929	2,664	772	Republic of Korea 469; Peru 415; Mexico 413.
Tin, metal, including alloys:				
Scrap	78	128	--	Republic of Korea 64; Thailand 43; China 17.
Unwrought	30,483	33,078	32	China 12,731; Indonesia 12,227; Malaysia 4,163.
Semimanufactures	862	1,386	1	Thailand 1,193; China 278; Malaysia 85.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Sources, 2004: United States	Sources, 2004: Other, principal
METALS--Continued					
Titanium:					
Ore and concentrate		457,124	450,287	--	Viet Nam 152,394; Australia 135,766; India 60,062.
Oxides		11,560	15,211	183	China 8,620; Republic of Korea 3,567; France 1,632.
Metal, including alloys, all forms		979	784	358	Russia 252; United Kingdom 87; Italy 20.
Tungsten:					
Ore and concentrate		758	134	--	Mainly from the Russia.
Metal, including alloys, all forms		1,145	1,474	120	China 977; Republic of Korea 108; Austria 88.
Uranium and thorium:					
Ore and concentrate		22	33	--	Malaysia 20; India 13.
Metal, including alloys, all forms		1,345	302	1	Mainly from Canada.
Vanadium, metal, including alloys, all forms					
Oxides and hydroxides		3,810	2,274	(2)	South Africa 1,200; China 1,074.
Metal including alloys, all forms		175	316	236	Germany 79; Russia 1.
Zinc:					
Ore and concentrate	thousand metric tons	1,060	1,125	188	Australia 404; Bolivia 149; Peru 182.
Oxides		18,924	19,097	503	China 9,492; Republic of Korea 5,617; India 1,520.
Blue powder		2,280	2,231	--	China 1,162; Republic of Korea 526; Singapore 282.
Ash and residue containing zinc		23,576 r	34,159	3,833	Republic of Korea 8,944; Iran 1,855; Philippines 1,037.
Metal including alloys:					
Scrap		72	97	16	Thailand 42; Republic of Korea 25; Philippines 14.
Unwrought		42,607	44,386	28	China 18,797; Peru 14,370; Namibia 4,101.
Semimanufactures		3,691 r	2,294	18	China 1,993; Republic of Korea 137; Switzerland 62.
Zirconium:					
Ore and concentrate		55,114	67,915	1,088	Australia 39,926; South Africa 21,219; Russia 3,975.
Metal including alloys, all forms		567	553	251	France 296; Sweden 4; United Kingdom 1.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		17,515	14,937	1,585	India 6,866; China 4,609; Turkey 1,141.
Artificial:					
Corundum		166,370	172,958	353	China 140,271; Austria 9,208; Australia 6,508.
Silicon carbide		78,253	86,141	23	China 82,376; Brazil 1,294; Norway 960.
Dust and powder of precious and semiprecious stones, including diamond	value, thousands	$1,701 r	$3,499	$3,137	China $284; Brazil $32; Belgium $21.
Grinding and polishing wheels and stones		6,939	7,971	189	China 4,339; Thailand 2,571; Republic of Korea 237.
Asbestos, crude	value, thousands	$9,550 r	$3,663	--	Canada $2,308; Brazil $753; Zimbabwe $462.
Barite and witherite		71,302	51,276	491	China 47,624; North Korea 2,828; Thailand 303.
Boron:					
Crude natural borates		31,792	40,994	84	Turkey 32,050; Russia 8,843; Chile 17.
Oxides and acids		41,561	50,568	20,578	Russia 23,006; Turkey 3,660; Chile 2,315.
Cement		858,666	841,114	1,396	Republic of Korea 794,161; China 31,051; France 12,569.
Chalk		10	1	--	All from Germany.
Clays, crude:					
Bentonite		197,203	215,815	174,162	China 39,759; New Zealand 948.
Chamotte or dinas earth		10,011	12,234	--	China 7,362; Republic of Korea 2,378; South Africa 2,351.
Fire clay		6,571	6,056	2,020	China 4,005; Russia 30; Belgium 1.
Fuller's earth		9,782	11,063	3,817	China 6,932; Australia 314.
Kaolin	thousand metric tons	1,277	1,275	793	Brazil 314; China 68.
Unspecified		144,394 r	158,729	1,748	China 155,348; India 741; Germany 277.
Diamond, natural:					
Gem, not set or strung	value, thousands	$992,927	$1,154,675	$41,345	India $499,831; Belgium $263,107; Israel $179,701.
Industrial stones	do.	$9,595	$10,086	$2,282	Botswana $3,275; Belgium $1,726; United Kingdom $1,382.
Dust and powder	do.	$45,671	$52,286	$7,788	Ireland $25,495; China $8,231; Switzerland $5,019.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2003	2004	Sources, 2004: United States	Sources, 2004: Other, principal
INDUSTRIAL MINERALS--Continued					
Diatomite and other infusorial earth		7,279	6,714	4,930	China 1,687; Netherlands 34; Germany 20.
Feldspar		7,912	18,312	--	Republic of Korea 16,197; Malaysia 759; China 607.
Fluorspar		239,021	444,043	--	China 294,806; Mexico 135,733; Mongolia 3,385.
Fertilizer materials					
Crude, n.e.s.		29,759	32,756	6	China 16,005; Indonesia 12,093; Philippines 1,473.
Manufactured:					
Ammonia		270,252	234,459	(2)	Indonesia 208,533; Republic of Korea 17,763; Bangladesh 7,984.
Phosphatic		165,768	171,958	42,930	China 112,967; Republic of Korea 10,624; Israel 5,400.
Potassic		864,843	961,052	193,309	Canada 418,307; Russia 107,645; Germany 57,044.
Graphite, natural		121,559	178,112	312	China 171,762; North Korea 2,768; Sri Lanka 1,860.
Gypsum and plaster	thousand metric tons	2,139 r	1,994	(2)	Australia 1,003; Thailand 982; China 4.
Iodine		1,021	509	27	Chile 468; Indonesia 14.
Lime		1,565	4,723	996	China 3,592; Republic of Korea 77; Malaysia 45.
Kyanite and related materials, mullite and unspecified		10,875	27,767	3,218	South Africa 12,893; China 8,802; Hungary 1,069.
Magnesium compounds:					
Magnesite, crude		790	7,107	--	China 6,747; Australia 360.
Oxides and hydroxides		569,112	611,479	459	China 585,656; Republic of Korea 13,238; North Korea 5,821.
Other		427	3,289	--	Germany 2,400; China 1.
Mica:					
Crude including splittings and waste		53,473	61,277	416	China 44,941; India 6,644; Canada 4,148.
Worked including agglomerated splittings		173	153	17	Belgium 30; China 27; United Kingdom 24.
Nitrates, crude		21,801	17,557	--	Chile 17,507; China 40; Germany 10.
Phosphates, crude		814,521	820,572	11,563	China 399,420; South Africa 174,731; Jordan 113,793.
Phosphorus		32,057	31,602	(2)	China 30,861; Netherlands 652.
Pigments, mineral, iron oxides and hydroxides processed		24,074	23,244	314	China 14,359; Germany 5,230; Sweden 1,385.
Precious and semiprecious stones, other than diamond:					
Natural	value, thousands	$147,245	$153,431	$4,601	Thailand $41,038; Hong Kong $34,098; Colombia $16,096.
Synthetic	do.	$17,928	$21,516	$11,044	China $3,082; Russia $1,444; Switzerland $1,296.
Pyrite, unroasted		7,491	9,951	--	All from China.
Quartz crystal, piezoelectric	value, thousands	$15,777	$20,943	$3,067	China $6,687; Thailand $3,528; Malaysia $3,376.
Salt and brine	thousand metric tons	7,493	8,066	2	Mexico 3,901; Australia 3,450; China 326.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	do.	113	105	1	China 23; India 18; Portugal 6.
Worked	do.	1,545	1,498	(2)	China 1,378; Italy 25.
Dolomite, chiefly refractory-grade	do.	2,367	2,347	(2)	China 1,173; Philippines 666; Thailand 485.
Gravel and crushed rock		235,843	246,363	706	China 103,975; Philippines 26,931; Other Asia, nes 98,336.
Limestone other than dimension	thousand metric tons	397	340	(2)	Malaysia 150; Viet Nam 97; Philippines 48.
Quartz and quartzite		155,693	163,408	4,821	India 57,486; Republic of Korea 51,407; China 33,188.
Sand other than metal-bearning and sand and gravel	thousand metric tons	6,448	6,307	6	China 4,395; Viet Nam 1,565; Australia 1,302.
Sulfur:					
Elemental:					
Crude including native and byproduct		1,080	1,672	--	Republic of Korea 888; China 784.
Colloidal, precipitated, sublimed		1,301	1,236	7	Republic of Korea 1,132; France 91; Germany 7.
Sulfuric acid		8,246	8,190	1	Republic of Korea 8,104; Other Asia, nes 84.
Talc, steatite, soapstone, pyrophyllite		345,215	300,924	4,783	China 272,412; Australia 17,407; Finland 4,095.
Vermiculite, perlite, chlorite		214,794	230,772	371	China 209,115; South Africa 17,895; Australia 1,717.
Other; slag and dross, not metal-bearing		616,742	492,862	476	Republic of Korea 150,701; South Africa 103,228; Other Asia, nes '47,467.

[r]Revised. -- 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.