

## THE MINERAL INDUSTRY OF

# MONGOLIA

By John C. Wu

Mongolia is a mineral-rich country. As a result of the geological surveys and preliminary investigations conducted by the joint exploration team of the Government and the Governments of the former U.S.S.R. and other member countries of Mutual Economic Assistance in the last 25 years, more than 6,000 occurrences of about 80 minerals were discovered in Mongolia. Government evaluated about 500 deposits of 40 minerals and revealed that for about 30 minerals, including asbestos, clays, coal, copper, diamond, fluorspar, gold, gemstones, graphite, gypsum, iron, lead, limestone, magnesium, molybdenum, nickel, petroleum, phosphate, platinum, rare earths, salt, sand and gravel, silica, silver, tin, tungsten, uranium, zeolite, and zinc, there were possibilities for the discovery and development of economic resources in Mongolia.

Mongolia's identified mineral resources of coal, copper, and fluorspar are very large. Identified mineral resources of gold, limestone, molybdenum, petroleum, phosphate, and uranium are fairly substantial. Identified mineral resources of gemstone, gypsum, lead, nickel, platinum, rare earths, silver, tin, tungsten, zeolite, and zinc are small. In 1997, only coal, copper, fluorspar, gold, gypsum, limestone and construction aggregate, molybdenum, salt, sand and gravel, silica, tin, tungsten, and uranium were produced. (*See table 1.*) Production of coal, copper, fluorspar, and molybdenum was by large-scale joint-venture operations, and the rest of the minerals were produced by small- and medium-scale joint-venture and private operations. Most of the mining operations were in the north-central and eastern parts of the country. In 1997, Mongolia was the third largest producer of fluorspar in the world and was the third largest producer of copper and molybdenum in the Asia and Pacific region.

To create a better environment for investment in the Mongolian mining sector and to attract foreign investors to participate in the exploration and development of Mongolian mineral resources, the Government revised its Mineral Resources Law and related Foreign Investment and Tax Laws in 1997. The major provisions under the revised laws are as follows: expansion of areas open for exploration to 40% from 12.7% of the total landmass, establishment of a cadastral office to issue exploration licenses and mining permits on a first-come first-served basis, granting of a 3-year exploration license with the right to two 2-year renewals, extension of a 60-year mining license for an additional 40 years, transferability of licenses, reduction of the royalty rate for all minerals to 2.5% from 12.5%, reduction of corporate income tax to 30% from 40%, tax allowances for capital expenditure on infrastructure and accelerated depreciation of fixed assets, exemption of import duty on plant and equipment, and simplification of foreign investment procedures (Mining Journal, 1997). The revised provisions became effective on July 1, 1997.

To implement the new Mineral Resources Law, the Government established the Mineral Resources Authority of Mongolia (MRAM) on May 30, 1997. MRAM has three offices—the Office of Geology, the Mining Office, and the Office of Geological and Mining Cadastre (Mineral Resources Authority of Mongolia, Introduction, accessed March 17, 1998, at URL <http://www.mram.mn/>). The State Geological Fund (SGF), another Government agency, is the center of Mongolian geological information (State Geological Fund, accessed April 7, 1998, at URL <http://www.mol.mn/sgf/>). More than 80% of the country has been mapped at a scale of 1:200,000 and 15%, at 1:50,000. Most of the geological information at SGF, is, however in the Mongolian or the Russian languages.

The mining industry comprised several large, joint-venture companies that mine and process copper, fluorspar, gold, limestone, and molybdenum; several large, state-owned companies that mine coal; and many medium- and small-sized, state-owned and privately owned companies that mine coal, construction aggregate, gold, sand and gravel, silica sand, tin, and tungsten. In 1997, several small, state-owned coal and gold mining companies were partially privatized. Partial and complete privatization of many state-owned mining companies was expected to continue during the next 2 to 3 years.

The Mongolian economy, as measured by real gross domestic product (GDP), grew 3.3% in 1997 compared with 2.6% in 1996 (Mineral Resource Authority of Mongolia, Mongolia's economy and opportunities for investment, accessed April 6, 1998, at URL <http://www.mram.mn/countryprofile.html>). The mineral industry was very important in the Mongolian economy. The output of the mineral industry accounted for about 16.8% of Mongolia's GDP. The mineral industry contributed about 33% to the State budget revenue. In minerals trade, exports of mineral products accounted for about 58% of Mongolia's total exports, and imports of mineral products accounted for about 20% of the country's total imports. The major export mineral products were ore and concentrates of copper, fluorite, and molybdenum. The major import mineral products were coal, ferrous and nonferrous metal products, and refined petroleum products.

In copper and molybdenum mining and milling, the Erdenet Mining Corp. (EMC) produced 21.6 million metric tons (Mt) of ore, which was processed into 433,000 metric tons (t) of copper concentrate and 3,820 t of molybdenum concentrate at the Erdenet Complex in Bulgan Aymag in north-central Mongolia. The copper concentrate produced in 1997 contained 28.94% copper with high contents of silver and selenium and the molybdenum concentrate contained 52.21% molybdenum with high contents of rhenium and selenium. At the Erdenet Complex, the mining capacity was about 22 million metric tons per year

(Mt/yr) of ore and the mill was capable of processing 20 Mt/yr of ore to produce up to 430,000 t of copper concentrate and 5,000 t of molybdenum concentrate. EMC exported 448,000 t of copper concentrate and 3,700 t of molybdenum concentrate in 1997. Copper concentrates were exported mainly to China, Japan, Russia, and Switzerland, and molybdenum concentrates were exported mainly to Russia and Switzerland.

EMC, a Mongolian-Russian joint-venture firm, is owned 51% by the Government of Mongolia and 49% by the Government of Russia. The Government, through its State Property Committee, announced that it planned to privatize EMC and other large, state-owned enterprises (State Property Committee of Mongolia, List of large enterprises to be privatized—Partially privatized enterprises, accessed April 14, 1998, at URL <http://www.spc.gov.mn/largeb.htm>). According to a report in *Novosti Mongolii*, a local newspaper, there were disagreements between the Mongolian and Russian Governments over privatization of the Russian equity share of EMC (MBT News Service, April 1, 1997, *Discord over Erdenet*, accessed May 8, 1997, at URL <http://www.magicnet.mn/mbt/>). According to another report in *Onoodor*, EMC had repeatedly ignored the demand of the State Property Committee to cooperate in the property registration process. It defended its refusal by claiming that the state does not own shares and that it was waiting for a final court decision on the property issue (MBT News Service, May 5, 1997, *Erdenet Concern*, the largest share company in Mongolia refused to cooperate in state property registration, accessed May 8, 1997, at URL <http://www.magicnet.mn/mbt/>).

In February, Erdmin Co. Ltd. began commercial operation of a 3,600-metric-ton-per-year (t/yr) solvent-extraction and electrowinning pilot plant to extract copper from pregnant solution in the mine leach dump near the Erdenet Mine. According to *Adrian Arch*, a local newspaper, operation of the pilot plant was temporarily stopped on February 10 because of the leakage of sulfuric acid to environment (MBT News Service, March 11, 1997, *American joint venture Erdmin on production of copper cathode temporarily stopped*, accessed March 25, 1997, at URL <http://www.magic.mn/mbt/>). According to the Toronto-based Armada Gold Corp., 49% owner of the Erdmin copper pilot plant, actions had been taken to improve construction and design engineering and to implement control on the technical aspects of production, including environmental measures (Armada Gold Corp., 1997). During the first 4 months of operations, the pilot plant produced 7 metric tons per day (t/d) of copper cathode with a purity of 99.997%. The level of production increased to 10 t/d from June 1997 to yearend. The production of copper cathode for all 1997 was about 2,950 t at a cash operating cost of \$0.50 per pound. Marubeni Corp. of Japan shipped about 50% of the refined copper, most of which went to Japan and other Asian countries. For the first time in Mongolian mining history, the country had become a producer and exporter of refined copper.

In December, Armada Gold announced that the planned capacity expansion of its joint-venture Erdmin copper refining plant would be financed by Marubeni Corp. The financing of the expansion was subject to a feasibility study to be conducted by Chiyoda Corp., a Japanese engineering company, in partnership with Kilborn-CMPS&F of Australia. The feasibility study was scheduled to be completed by May 1998. According to Armada

Gold, the expected production of copper cathode for Phase II, after the completion of the expansion, would be 60 t/d at a cash operating cost of between \$0.25 and \$0.30 per pound (Armada Gold, 1998). Erdmin Ltd. is owned by EMC (51%) and Armada Gold (49%).

In gold mining, production reached another record high in 1997. Gold was produced mainly by Mongolrostsvetmet Corp. (MONROS) in the Tolgoit and the Tuulgol areas and accounted for 25% of the total production in 1997. The remaining gold production was by three other joint venture companies—Mongoczechoslovakmetal, Vancouver-based Mongolia Gold Resources Ltd. (MGR), and Mongolbulgargeo; by several state-owned companies, including Almass, Bayangol Jalga, Erdes, Ikh Alt, Ikh Uvuljuu, Jargalant Ikh, Khavchuu Alt, Khailaast, Shijir Alt, and Shoroon Ord; and about 40 other small, state-owned and privately owned companies. The major gold-mining areas were at Tolgoit, Sharin Gol, Havchuu, Ikh Uvuljuu, and Burhant in north-central Mongolia; at Mukhar Ereg and Uvur Chuluut in the Bayakhongor area of southwestern Mongolia; and at Bumbat, Khailaast, Nariin Gol, Tsagan Chulut, Tosongin Gol, and many other placer deposits along the Tuul River in the Zaamar District of north-central Mongolia. According to an estimate by ITI Bank of Mongolia in 1996, the gold industry employed a total of 4,200 people.

MGR, in joint venture with Mongol Alt Corp. of Mongolia, began operations at the Bumbat gold mine in the Zaamar District, northwest of Ulaanbaatar in mid-July. According to MGR, gold production from the Bumbat Mine totaled 47.1 kilograms (kg) at a cash operating cost of \$205.01 per troy ounce with an overall recovery rate of 73%. In 1997, about 22,000 t of ore was mined from the 118 vein, and about 19,000 t of ore was milled with an average head grade of 3.38 grams per metric ton. The area was estimated to contain about 20 t of gold resources (Mongolia Gold Resources Ltd., *Progress update on the Bumbat property, Mongolia*, March 2, 1998, accessed April 6, 1998, at URL <http://www.stockgroup.com/mgr/news/030298.htm>).

Steel production using iron and steel scrap by Darhan Minimetals, near Darhan, had been below 50% of the installed capacity of 100,000 t/yr since the plant came on-stream in October 1993. According to the World Bank, because of the heavy burden in the Government budget for the repayment of the Japanese yen loan, the Government had requested that the World Bank carry out a viability study for the future operation of the plant. The \$61-million loan was originally provided by the Import-Export Bank of Japan. Later, Itochu Corp., a major Japanese trading company, took over the yen loan from the Import-Export Bank of Japan (Metal Bulletin, 1997).

Production of tin and tungsten remained small in 1997. Production of tin and tungsten was from the Bain-Mod (Modot), the Khujkhan, and the Kharmaitin Mines. The Burentsogt Mine in Dornod Aymag in southeastern Mongolia, the Ulaan Uul and the Khovd Gol Mines in Bayan Olgiy in western Mongolia, and the Tsagaan Davaa Mine in Tov Ayamg in north-central Mongolia remained closed in 1997.

In 1997, production of fluorspar was 593,900 t, of which about 75% of the ore was processed into fluorspar concentrate and the remainder sold as direct-shipping ore. Production of fluorspar concentrate remained unchanged from that of 1996. The

fluorspar concentrate produced in 1997 contained 92% of calcium fluorite. Most of the direct-shipping fluorspar ore and fluorspar concentrate was exported to Kazakhstan, Russia, and Ukraine. The company's main operations at Bor Ondor included an underground mine, an open-pit mine, and a fluorspar concentrator. It also operated open-pit mines at Khar-Airag, Khajuu (Khazhu) Ulaan, and Urgon (Orgon) in Dornogovi Aymag and an underground mine at Berh in Henity Aymag. MONROS planned to expand the capacity of its concentrator to 200,000 t/yr (150,000 t/yr acid-grade and 50,000 t/yr metallurgical-grade) by 2000 (Industrial Minerals, 1997).

Coal production decreased slightly to below 5 Mt in 1997. In 1997, the two large-scale coal mines were the Baga Nuur in Tov Aymag with an output of about 3 Mt and the Shariyn Gol in Selenge Aymag with an output of 1 Mt. The medium-scale coal mines producing between 200,000 and 600,000 t were the Aduunchuluun in Dornod Aymag and the Shivee Ovoo in Dundovi Aymag. Many small-scale coal mines produced less than 100,000 t, mainly at Bayanteeg, Mogoingol, Talbulag, Tevshingobi, and Hudlun. Most of the coal produced in Mongolia was steam (brown) coal. About 75% of the total coal output was consumed by the utility industry for power generation. There were three major metallurgical-grade coal mines producing between 50,000 and 170,000 t at Nuurshotgor and Har Tarvagataj in Uvs Aymag and at Tavatulgoi in Omnogovi Aymag. According to the Government, most of the state wholly owned and majority owned coal companies were expected to be either partially or completely privatized within the next 2 to 3 years (State Property Committee of Mongolia, 1997, Preliminary list of SOE enterprises under privatisation in 1997, accessed April 7, 1998, URL <http://www.mol.mn/mri/AIMAKS.html>).

In oil exploration, London-based SOCO International, Inc., a majority-owned subsidiary of Snyder Oil Corp. of the United States, in partnership with NTI Resources Limited and Territorial Resources Inc. of Canada, continued to explore for oil in Blocks XXI and XIX in the Tamtsag-Hailar Basin of northeastern Mongolia. By mid-1997, SOCO had drilled seven wells that had resulted in four oil discoveries, including 19-2 and 19-3 wells in Block XIX and 21-1 and 21-2 wells in Block XXI. According to World Oil (1997), tanks and pumps had been installed by SOCO for oil production at 19-2 well and 21-1 well in 1997. SOCO exported its crude petroleum output to China.

In February, Nescor Energy of the United States was awarded a production-sharing contract by the Government for oil

exploration in Blocks 13 and 14 in East Gobi and to extract crude petroleum from about 24 existing oil wells in the Zuunbayan and the Tsagaan Els oilfields in southeastern Mongolia. According to Mongolian Business Times (1997), Nescor Energy signed an agreement with the Chinese National Oil and Chemical Company in April 1997 to export 15,000 barrels of crude petroleum from its exploration areas to China.

In uranium exploration, World Wide Minerals Ltd. of Canada acquired 58% of equity interest in Central Asian Uranium Co. Ltd. to reactivate the existing low-cost open-pit and underground uranium mines in Dornod Aymag. The company expected to complete the first phase of development of an open-pit mine and a heap-leaching pad by early 1998 and to produce 800,000 pounds, or about 362,874 kg, of U<sub>3</sub>O<sub>8</sub> per year by mid-1998 (World Wide Minerals Ltd., July 6, 1997, World Wide starts to reactivate low cost uranium mine in Mongolia, accessed December 9, 1997, at URL <http://www.worldwideminerals.com...1b59ed853564e2004deb21>).

## References Cited

- Armada Gold Corp., 1997, Mongolian copper plant producing 7 tons of copper cathode daily: Armada Gold Corp., April 21, p. 1.
- 1998, Armada secures financing for phase II expansion of copper project in Mongolia: Armada Gold Corp., December 8, p. 1.
- Industrial Minerals, 1997, Fluorspar 1997—Optimistic outlook overall—New development from Mongolia: Industrial Minerals, no. 363, p. 25.
- Metal Bulletin, 1997, Mongolia seeks World Bank review of mini-mill: Metal Bulletin, no. 8181, May 26, p. 41.
- Mining Journal, 1997, Mongolia overhauls minerals policy: Mining Journal, v. 823, no. 8433, June 13, p. 463.
- Mongolian Business Times, 1997, 15 thousand barrels of oil to be exported to China: MBT News Service, April 29, p. 1.
- World Oil, 1997, Mongolia: World Oil, v. 218, no. 8, p. 165-66.

## Major Source of Information

Mineral Resources Authority  
State Building No. 5, Builders' Square 13  
Ulaanbaatar 211 238, Mongolia  
Fax: 976-1-310 370  
URL: <http://www.mram.mn>  
E-mail: [mram@magicnet.mn](mailto:mram@magicnet.mn)

## Major Publication

Statistical Office of Mongolia: Monthly Bulletin of Statistics.

TABLE 1  
MONGOLIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1993	1994	1995	1996	1997 p/
Cement, hydraulic thousand tons	82	86	109	106	112
Coal do	5,609	5,012	4,871	5,111	4,922
Copper:					
Mine output, Cu content e/ 3/	96,900	99,600	100,400	101,900	125,300 4/
Metal, refined e/	--	--	--	--	2,950
Fluorspar:					
Acid grade thousand tons	77	88	120	130	130 4/
Submetallurgical and other grade e/ do.	276	85	119	124	120
Total	353	173	239	254	250
Gold, mine output, Au content 5/ kilograms	1,200	2,000	4,800	5,300	8,000
Gypsum e/ thousand tons	25	25	25	25	58 4/
Lime, hydrated and quicklime do.	51	66	51	55	60 e/
Molybdenum, mine output, Mo content e/ 6/	2,050	2,100	1,830	2,200	1,992 7/
Salt, mine output	603	200	497	429	450 e/
Silver, mine output, Ag content e/ 7/ kilograms	17,500	18,900	19,100	19,300	19,400
Steel, crude	--	12,222	22,239	22,605	22,500 e/
Tin, mine output, Sn content e/	150	100	150	100	50
Tungsten, mine output, W content e/	250	150	200	200	100
Uranium, mine output, U content e/	100	100	100	100	100

e/ Estimated. p/ Preliminary.

1/ Table includes data available through April 22, 1998.

2/ In addition to the commodities listed, crude construction materials, such as sand and gravel; varieties of stone, such as limestone; and silica are produced, but available information is inadequate to make reliable estimates of output levels.

3/ Based on 29% copper contained in copper concentrate.

4/ Reported figure.

5/ Includes reported raw gold production and 0.2 gram of gold per metric ton of copper concentrate.

6/ Based on 47% molybdenum contained in molybdenum concentrate.

7/ Based on 55 grams of silver per metric ton of copper concentrate.

Source: Statistical Office of Mongolia (Ulaanbaatar). Monthly Bulletin of Statistics, 1996-98.