



2020–2021 Minerals Yearbook

UKRAINE [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF UKRAINE

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Note: In this chapter, information for 2020 is followed by information for 2021.

In 2020, Ukraine was among the world's leading producers of several minerals. Ukraine was the 3d-ranked producer of rutile (15.7% of world output); the 5th-ranked producer of titanium sponge (2.2%; not including United States production) and bromine (1.3%; not including United States production); the 6th-ranked producer of ilmenite (5.8%), iron ore (Fe content) (3.2%), and graphite (1.7%); the 7th-ranked producer of kaolin (3.6%), manganese ore (Mn content) (3.1%), and magnesium metal (0.6%; not including United States production); the 8th-ranked producer of pig iron (1.5%); the 10th-ranked producer of alumina (1.3%); and the 11th-ranked producer peat (2.4%) and raw steel (1.2%, shared with Taiwan). Ukraine was also a significant world producer of bentonite, lime, nitrogen, salt, and silicon. The country had significant coal and uranium resources but depended on imported petroleum and natural gas (Apodaca, 2022a, b; Bolen, 2022; Bray, 2022a, b; Briocche, 2022; Gambogi, 2022a, b; Olson, 2022; Schnebele, 2022a–c; Simmons, 2022; Tuck, 2022a, b).

By 2020, Ukraine had stabilized production throughout the economy following the political upheaval of 2014 associated with Russia's incursion into the Crimea Peninsula. In addition, ongoing attempts by separatist groups in eastern Ukraine to form their own separatist republics resulted in armed conflict with the Government that continued throughout 2020 (U.S. Central Intelligence Agency, 2021).

Minerals in the National Economy

In 2020, Ukraine's real gross domestic product (GDP) decreased by 3.8% compared with a 3.2% increase in 2019.¹ The nominal GDP in 2020 amounted to \$156.5 billion.² Total industrial production in 2020 was 3.20 trillion hryvnias (about \$118.7 billion), which was a 4.5% decrease compared with that in 2019. Mining and quarrying constituted 360.2 billion hryvnias (about \$13.4 billion), or 11.2% of industrial production. The State Statistics Committee of Ukraine reported that in 2020 the share of manufacturing in industrial production was 57.9%. The share of metallurgical production in industrial production was 12.4%; the share of chemical and chemical products in industrial production was 2.5%; and the share of coke and refined petroleum in industrial production was 2.2%. Manufacturing production decreased by 5.9% compared with a 0.9% increase in 2019, including a 5.1% increase in manufacturing of chemicals and chemical products compared with a 12.9% increase in 2019; a 2.0% decrease in manufacturing of coke and refined petroleum

¹The data in this section exclude the territory of the Autonomous Republic of Crimea, the city of Sevastopol, and part of the territory in Donetsk and Luhansk regions.

²Where necessary, values have been converted from Ukrainian hryvnia (UAH) to U.S. dollars (US\$) at the annual average exchange rates of UAH26.9735=US\$1.00 for 2020 and UAH27.2786=US\$1.00 for 2021.

compared with a 3.1% increase in 2019; and an 8.7% decrease in metallurgical production compared with a decrease of 1.4% in 2019 (State Statistics Service of Ukraine, 2021a, p. 22, 29, 157; 2021b, p. 238–244; 2022b, p. 234–235, 240).

Government Policies and Programs

In August 2019, the Parliament began consideration of a new bill, called Bill 1210, that would change the tax rules for companies producing iron ore. The bill proposed to increase rent for the use of subsoil to 10% of the value of extracted commodities from the previous 8% and, as a basis for taxation, to use the commodity category (for example, agglomerate, concentrate, or pellets) with iron content of between 62% and 67% rather than iron ore with an iron content of 30%. The proponents of the changes argued that an increase in taxation was needed to extract excess profits related to increased world market prices for iron ore, and opponents claimed that the increase in taxation could bankrupt Ukraine's iron ore industry. One proposed change to the bill was to tie the rent rate to the world price of iron ore so that when the world prices are higher, the rent rates would also be higher and, conversely, when the world prices are lower, the rent rates would be lower (Channel 5, 2019; Koval', 2019; Capital.ua, 2020).

Bill 1210 was signed into law in January 2020 and went into effect in May 2020. According to the new law, rent rates for the production of iron ore are increased to 12% from 8% if the world price of iron ore exceeds \$70 per metric ton and to 11% if the world price is at or below \$70 per metric ton. The rent rate for the production of manganese ore increased to 6.25% from 5%. The nature of the changes in the tax law was different than when Bill 1210 was first introduced, however. Originally, the idea was to impose rents on export prices rather than on the company costs. In the adopted law, however, the basis on which the tax is levied was not changed, and rents continue to be applied to the mine cost, which is reported by the companies (Datsenko, 2021a, b; Economichna Pravda, 2021).

Production

The production of many mineral commodities decreased in 2020 compared with that in 2019, and some of the decreases were owing to the effects of the coronavirus disease 2019 (COVID-19) pandemic. The output of manganese metal decreased by 54%; peat for fuel use, by 50%; graphite, by 38%; other ferroalloys, by 34%; silicomanganese, by 30%; magnesium metal and titanium sponge, by 25% each; ferromanganese, by 19%; salt, by 18%; feldspar, by 17%; steel pipe, by 15%; and peat for horticultural use, by 14%. On the other hand, production of ammonia increased by 53%; iron ore, by 25%; secondary copper, by 19%; refined petroleum, by 18%;

bromine, by 13%; and mined manganese, by 12%. These and other production data are in table 1.

Structure of the Mineral Industry

Table 2 is a list of major mineral industry facilities. The State Service of Geology and Mineral Resources of Ukraine was responsible for implementing Government policy for geologic exploration and rational use of subsoil, issuing exploration and production licenses for all mineral resources and monitoring their performance as well as establishing production-sharing agreements. The Ministry of Energy was responsible for the formation and implementation of Government policy regarding the coal industry, electric power, natural gas and petroleum production and processing, and the nuclear industry.

Mineral Trade

The total value of Ukraine's exports of goods and services decreased to about \$59.4 billion in 2020 from \$64.1 billion in 2019, and exports of goods decreased to \$49.2 billion in 2020 from \$50.1 billion in 2019. The value of total exports was equal to about 38.0% of Ukraine's GDP in 2020. One of Ukraine's leading export categories in terms of value was base metals and products made of them and, in 2020, they were valued at \$9.0 billion and made up 18.3% of the total value of all exports of goods. Of this amount, exports of ferrous metals amounted to \$7.7 billion, or 15.7% of the total exports of goods. Exports of mineral products were valued at \$5.3 billion and made up 10.8% of the total value of exports of goods, of which ores, slag, and ashes amounted to \$4.4 billion (8.9%); exports of mineral fuels and petroleum product contributed \$555 million (1.1% of the total value of exports of goods); and exports of salt, soil, stones, and sulfur were valued at \$356 million (0.7 % of the total value of exports of goods). Together, the value of exports of mineral products and metals made up about 29.1% of the total value of exports of goods. Ukraine's main export partners for goods were China (which received 14.4% of Ukraine's exported goods); Poland (6.7%); Russia (5.5%); Turkey (5.0%); Germany (4.2%), India (4.0%); and Italy (3.9% each) (State Statistics Service of Ukraine, 2021a, p. 10, 32; 2021c, p. 8–43; 2022b, p. 348–358; 2022c, p. 8–43).

The total value of Ukraine's imports of goods and services was about \$60.2 billion in 2020 compared with \$67.8 billion in 2019. The total value of Ukraine's imports of goods was \$54.3 billion in 2020 compared with \$60.8 billion in 2019. One of the leading imported commodities was mineral fuels and refined petroleum products, which made up about 14.7% of the total value of imports of goods in 2020. The country's main import partners in 2020 were China (which supplied 15.3% of Ukraine's imports); Germany (9.8%); Russia (8.4%); Poland (7.6%); the United States (5.6%); Belarus (5.3%); and Turkey (4.5%) (State Statistics Service of Ukraine, 2022b, p. 348–358; 2022c, p. 8–43).

Commodity Review

Metals

Bauxite and Alumina.—In 2020, the Nikolayevskiy Alumina Refinery (NGZ), which was the only producer of alumina in Ukraine, increased production by 2.1% to 1.73 million metric tons (Mt) from 1.69 Mt in 2019. In the past several years, NGZ expanded its production facilities and increased production. Compared with production in 2014, when the plant produced 1.45 Mt of alumina, production in 2020 increased by 17%. NGZ produced alumina from imported bauxite using the hydrochemical Bayer method. According to the plant data, the unit cost of alumina at NGZ was about \$226 per metric ton. The company was one of the leading five taxpayers in the country (tables 1, 2; NikVesti, 2020; Khishenko, 2021).

In November, the nongovernmental organization (NGO) “Stop Slam” filed a 9.2-billion-hryvnias (about \$341 million) lawsuit against NGZ, claiming, on behalf of 1,279 people, moral damages associated with the waste material of alumina production. The NGZ lawyers claimed that the lawsuit was an attempted raider takeover of the plant. As of yearend, the results of the lawsuit were not known (Khishenko, 2021).

Ferroalloys.—In 2020, Ukraine produced a total of 830.9 metric tons (t) of ferroalloys, which was a 25.4% decrease compared with that in 2019. Production of silicomanganese decreased by 30.4% to about 559,900 t, production of ferromanganese decreased by 18.6% to 122,960 t, and production of ferrosilicon decreased by 2.8% to 60,800 t. In Ukraine, the leading ferroalloys plants were the Kramatorskiy ferroalloys plant (KZF), the Nikopol'skiy ferroalloys plant (NZF), the Pobuzhskiy ferronickel plant (PFK), and the Zaporozhskiy ferroalloys plant (ZZF) (tables 1, 2; GMK Center, 2021c; Metallplace, 2022).

Iron and Steel.—In 2020, Ukraine reduced raw steel production to 20.55 Mt, or by 1.4% compared with that in 2019, and steel pipe, to 850,000 t, or by 15.4%. Pig iron production increased by 1.8% to 20.4 Mt, and rolled steel, by 1.3% to 18.4 Mt. In 2020, the leading raw steel producers in Ukraine were PAO ArcelorMittal Kriviy Rih, which produced 4.7 Mt; OAO Azovstal Iron and Steel Works, 4.2 Mt; OAO Ilyich Iron and Steel Works, 4.1 Mt; JSC Zaporizhstal', 3.8 Mt; ChAO Kamet-Stal' (formerly Dneprovskiy Metallurgical Complex), 2.6 Mt; PAO Interpipe Stal', 0.8 Mt; and ChAO Dneprovskiy Metallurgical Plant, 200,000 t (tables 1, 2; Share UA Potential, 2021; GMK Center, 2022b).

Iron Ore.—In 2020, Ukraine produced 78.8 Mt of usable iron ore, which was a 24.7% increase compared with that in 2019. According to customs statistics, in 2020, Ukraine exported 46.29 Mt of iron ore, which was a 16% increase compared with that in 2019, and in terms of value, export revenue increased by 24.7% to \$4.24 billion. The leading recipients of Ukraine's exports of iron ore were China, which received 60% of the exports, Poland (9%), and Czechia (7%). The leading producers of iron ore in Ukraine were PAO ArcelorMittal Kriviy Rih, and the ChAO Inguletskiy Mining and Metallurgical Complex (GOK), PAO Krivorizhskiy Iron Ore Complex (KZhrK), Poltavskiy GOK, ChAO Severnyi GOK, Sukha Balka GOK, ChAO Tsentral'nyi GOK,

PAO Yuzhnyi GOK, and ChAO Zaporozhskiy Iron Ore Complex (ZZhRK) (Censor.NET, 2021b; GMK Center, 2021b).

In 2020, KZhRK, which was one of the leading producers of iron ore, decreased production to 3.81 Mt, or by 13.3% compared with that in 2019. KZhRK included four underground mines, and their total resources amounted to 210 Mt of ore with average iron content of 58.6%. ZZhRK was located in Zaporizhzhia Oblast' and was developing the Pereverzevskoye and the Yuzhno-Bilozerskoye deposits. In 2020, ZZhRK kept its production practically unchanged compared with that in 2019, at 4.6 Mt of usable ore. ZZhRK shipped its output to Zaporozhstal' and exported the products to Austria, Czechia, Poland, and Slovakia (Fixygen, 2021; Kolisnichenko, 2021).

Manganese.—In 2020, Ukraine produced an estimated 642,000 t of manganese in concentrate, which was an 11.9% increase compared with that in 2019. In 2020, Ukraine decreased imports of manganese ore and concentrate by 51.9% to 581,200 t. In terms of value, imports of manganese ore and concentrate decreased by 63.7% to about \$76.5 million. According to customs statistics, most imports (in terms of value) came from Ghana (88.8%), Russia (8.3%), and South Africa (2.9%). In 2020, Ukraine exported and reexported 33,225 t of manganese ores and concentrates valued at \$3.3 million, of which 88.0% (by value) was exported to the United States; 10.3%, to Czechia; and 1.2%, to Hungary (table 1; Interfax Ukraine, 2021).

In 2020, Ukraine had two major producers of manganese concentrate—the PAO Marganetskiy GOK and the ChAO Pokrovskiy GOK (formerly the Ordzhonikidzevskiy GOK), both of which were located in Dnipropetrovsk Oblast'. The Marganetskiy GOK was the only enterprise in Ukraine that mined manganese using an underground method; this method accounted for about 80% of the GOK's mined ore, and open pit mining accounted for the remaining 20%. The GOK mined the eastern portion of the Nikopol'skoye manganese deposit and included two open pits, seven underground mines, two beneficiation plants, and auxiliary services. The Marganetskiy GOK engaged in production and beneficiation of manganese ore, production of bentonite clays, extraction of slag from metallurgical waste, and production of manganese sulfate. In 2020, the Marganetskiy GOK produced 551,400 t of manganese concentrate, which was a 5.5% increase compared with that in 2019. In December, the GOK announced that it had completed the construction of a plant for processing manganese slag. Construction of the plant cost about \$20.7 million, and the plant had the capacity to process 5 million metric tons per year (Mt/yr) of manganese slag and to produce up to 1 Mt/yr of manganese concentrate (table 2; Marganetz.wordpress.com, 2019; Kolisnichenko, 2020; Ukrudprom.com, 2020).

The ChAO Pokrovskiy GOK was the other producer of manganese ore in Ukraine. The GOK produced manganese using an open pit method and mined the western part of the Nikopol'skoye manganese deposit. In 2020, the Pokrovskiy GOK produced 1.34 Mt of manganese concentrate, which was a 22.4% increase compared with the output in 2019, and 187,050 t of manganese agglomerate, which was a 105% increase compared with the output in 2019 (Marganetz.wordpress.com, 2019; Kolisnichenko, 2020; Ukrudprom.com, 2020).

Industrial Minerals

Cement.—In 2020, Ukraine's cement production amounted to 9.57 Mt, which was a 4.0% increase compared with the output in 2019. Clinker production increased by 2.4% and amounted to 7.42 Mt. Annual cement production per capita in Ukraine was about 226 kilograms (kg), which was lower than in Turkey (882 kg), Russia (370 kg), Belarus (350 kg), and Moldova (300 kg). In 2020, the leading producers of cement included PAO Podolsk Cement (owned by CRH plc), PAO Nikolayevtsement (owned by CRH plc), OOO Cement (owned by CRH plc), PAO Ivano-Frankovsktsement, PAO Dyckerhoff Cement Group, and PAO Eurocement Ukraine. In 2019, HeidelbergCement AG of Germany sold its assets in Ukraine to Overin Ltd., which was owned by Concorde Capital Group. Reportedly, HeidelbergCement intended to simplify its business and to reduce plants working in markets with high risk or with low growth potential (tables 1, 2; Il'yn, 2019; Espresso.tv, 2020; Jcement.ru, 2021; Dako Group Ltd., 2022).

Since August 2019, Ukraine had in place a ban on imports of cement from Russia and import tariffs on cement from Belarus and Moldova. More than 80% of Ukraine's imported cement was from Turkey. In September, an Interagency Commission for International Trade began an antidumping investigation of cement imports from Turkey. The commission stated that cement imports from Turkey increased ninefold in 2019 and were expected to increase to 1 Mt/yr in 2020. The commission was concerned that an influx of cement from Turkey would likely lead to a reduction in investment in domestic cement plants and potential flight of foreign investment in Ukraine's cement industry. Moreover, domestic cement producers adhered to Ukraine's cement quality standards, yet no certification was required for the imported cement (Espresso.tv, 2020; Property Times, 2020).

Mineral Fuels and Related Materials

Uranium.—In 2020, production of mined uranium in Ukraine decreased by 7% to 744 t. The only enterprise producing uranium in Ukraine in 2020 was the Vostochniy GOK, which mined uranium at four deposits—the Michurinskoye, the Novokonstantinovskoye, the Tsentral'noye, and the Vatutinskoye. Of these four deposits, the Novokonstantinovskoye was the largest; it had a design capacity to produce 1,500 metric tons per year (t/yr) of uranium. It was expected that the Vatutinskoye deposit would be depleted in 2023, and the Michurinskoye and the Tsentral'noye deposits, in 2028. The powerplants in Ukraine required about 2,500 t/yr of uranium. It was expected that development of the Novokonstantinovskoye and the prospective Aprelevskoye deposits would require about 9.1 billion hryvnias (about \$337 million) (tables 1, 2; TASS News Agency, 2021; Uatom.org, 2022; Yarosh, 2022).

In December, the Vostochniy GOK stopped operations owing to financial problems. Earlier, the Vostochniy GOK had signed a contract with NAEK Energoatom, the operator of all 15 of Ukraine's nuclear powerplants, for shipment of 800 t of uranium. Both companies were Government-owned, and the payment was made in advance at the beginning of the year.

By the end of the year, however, the Vostochnyi GOK did not have enough uranium to fulfill the contract. One idea of how to resolve the problem between Energoatom and the Vostochnyi GOK was to merge the two enterprises, but it was not clear if this measure would succeed in resolving the problem (Levchenko, 2020; Uatom.org, 2022; Yarosh, 2022).

MINERAL INDUSTRY HIGHLIGHTS IN 2021

Minerals in the National Economy

In 2021, Ukraine's real GDP increased by 3.4%. The nominal GDP in 2021 amounted to 5.45 trillion hryvnias (about \$200 billion). Total industrial production in 2021 was about \$172 billion. Mining and quarrying constituted about \$21.9 billion, or 12.8% of industrial production. In 2021, real industrial production increased by 1.9%. Mining of metal ores increased by 2.5%; production of crude petroleum and natural gas decreased by 2.2%; mining of hard coal and lignite increased by 7.0%; and other mining and quarrying increased by 21.1%. The State Statistics Committee of Ukraine reported that, in 2021, the share of manufacturing in industrial production was 55.9%. The share of metallurgical production in industrial production was 14.5%; the share of chemical and chemical products in industrial production was 2.6%; and the share of coke and refined petroleum in industrial production was also 2.6% (State Statistics Service of Ukraine, 2022a, p. 12–14; 2022b, p. 234–35, 240).

The total value of Ukraine's exports of goods and services increased to about \$79.3 billion in 2021; exports of goods increased to \$68.1 billion. Ukraine's leading export category, in terms of value, was base metals, which constituted 23.5% of total exports, including exports of ferrous metals that were valued at \$7.7 billion and made up 20.5% of the total value of all exports of goods; exports of cinder, ores, and slag were valued at \$7.1 billion and made up 10.5% of the total value of exports of goods. Exports of mineral fuels and petroleum products were valued at \$784 million (1.2% of the total value of exports of goods). Exports of salt, soil, stones, and sulfur were valued at \$510 million (0.7% of the total value of exports of goods). The main recipients of Ukraine's exports were China (which received 11.8% of Ukraine's exported goods), Poland (7.7%), Turkey (6.1%), Italy (5.1%), Russia (5.0%), Germany (4.2%), and India (3.7%) (State Statistics Service of Ukraine, 2022c, p. 348–359).

Government Policies and Programs

In 2020, Bill 1210 was signed into law; however, the proponents of the original bill felt that it did not achieve the primary goal; that is, to make companies producing iron ore and manganese ore pay a fair share of their profits to the Government. As a result, a new bill, called Bill No. 5600, was developed. According to this bill, rent payments on extracted iron ore would be imposed as a percentage of the world price of ore and the rate would increase as the world price increases. Specifically, when the world price is below \$65 per metric ton, the rent rate is 0.1%; when the price is between \$65 and \$85 per metric ton, the rent rate is 3%; for world prices between \$85 and \$120, 8%; between \$120 and \$150, 12%;

between \$150 and \$180, 14%; and above \$180, 16%. The rent payments would be split between the Government and local budgets in a 60:40 proportion. The goal of Bill No. 5600 was to extract from subsoil users a portion of the profits that the Government considered excessive and to bring ore taxation policy in Ukraine in line with international practice. In December 2021, Bill No. 5600 was signed into law. The rent from other types of ore—specifically manganese ore—was not changed and continued to be computed the old way, based on company costs (Datsenko, 2021a, b; *Economichna Pravda*, 2021).

Production

The production of most mineral commodities increased in 2021 compared with that in 2020. In 2021, the output of manganese metal increased by 177%; zirconium, by 81%; ferrosilicon, by 44%; kaolin, by 38%; bromine, by 27%; coal anthracite, by 26%; feldspar, by 20%; peat for horticultural use, secondary copper, and silicomanganese, by 18% each; gypsum and steel pipe, by 15% each; sulfuric acid, by 14%; cement, by 13%; and peat for fuel use, by 10%. Gallium production increased to 1,000 kg from zero in 2020. On the other hand, production of uranium decreased by 39%; ferromanganese, by 18% and ferronickel, by 16%. Also, gallium production restarted in 2021 (table 1).

Commodity Review

Metals

Ferroalloys and Manganese.—In 2021, Ukraine's ferroalloy plants increased production to 925,600 t (estimated), or by 11.3% compared with that in 2020. Ferrosilicon production increased by 44.1% to 87,600 t, and manganese metal production increased by 177% to 7,750 t. The NZF and ZZF increased production of silicomanganese by 18.4% to 662,700 t. KZF, NZF, and ZZF decreased ferromanganese production by 18.2% to 100,600 t. KFZ was not in operation in 2021, but in 2020, it produced 34,090 t of ferromanganese. In 2021, Ukraine exported 509,000 t of silicomanganese, which was a 12% increase compared with silicomanganese exports in 2020; of this quantity, 272,000 t was exported to Europe and 139,000 t, to Turkey. In 2021, exports of ferromanganese decreased by 51% to 27,000 t, and exports of ferrosilicon increased by 57% to 47,000 t (tables 1, 2; GMK Center, 2022a; Metallplace, 2022).

In 2021, Ukraine produced 600,000 t of manganese in concentrate (which was a 6.5% decrease compared with that in 2020) and 1.76 Mt of manganese concentrate. The Marganetskiy GOK produced 551,400 t of manganese concentrate, and the Pokrovskiy GOK, 1.21 Mt. Also, the Pokrovskiy GOK produced 258,800 t of manganese agglomerate, which was a 38.4% increase compared with that in 2020 (tables 1, 2; GMK Center, 2022a).

Titanium.—In April 2021, Group DF won the auction conducted by the State Service for geology and subsoil. Group DF was to pay about \$1.84 million (50.1 million hryvnias) for the exploration license for the Selishanskiy section in Zhytomyr Oblast'. Previous exploration studies suggested that the ilmenite content in the section was

between 50 and 70 kilograms per cubic meter, but no comprehensive estimate of the resources had been completed (Metallurgprom, 2021).

Industrial Minerals

Graphite.—In April, gold and graphite explorer Volt Resources Ltd. of Australia agreed to acquire a 70% stake in the Zavalievskiy graphite complex. The agreed purchase price was \$7.6 million, to be paid in two equal installments. The attractiveness of the deal to Volt Resources was the close proximity to key markets of lithium-ion batteries, primarily European automakers and the renewable energy sector. Also, the company planned to leverage its existing customer base and supply chain for development of its Bunyu graphite project in Tanzania. Zavalievskiy Graphite operated an open pit mine in Ukraine and had the capacity to produce 30,000 t/yr of graphite; the company exported its output to countries in Europe and Asia. Volt Resources restarted operations at Zavalievskiy Graphite in December and was planning to implement a Joint Ore Reserves Committee-compliant mineral resource estimate shortly thereafter (Elitsystem.com.ua, 2020; HedgeThink, 2021; Levchuk, 2021; Mining Technology, 2021; Rebeiro, 2021).

Also in April, OOO Spis Ukraina won a tender organized by the State Service for Geology and Subsoil for development of the Gorodnyavskiy section of the Burtinskiy Mine that is located in Khmelnytskyi Oblast'. The winning tender offer was 45 million hryvnias (about \$1.65 million), which was 2.1 times higher than the starting price, and the winner obtained a production license for 20 years. The resources of the deposit were estimated to be 130 Mt with average graphite content of 5.14%. OOO Spis Ukraina was registered in 2010 in the city of Lviv, but the ultimate investor was indicated as Onur Group of Turkey. It was expected that the total investment in the graphite deposit would amount to between \$60 million and \$280 million. The development of the deposit was expected to begin within 6 to 12 months (Censor.NET, 2021a; GMK Center, 2021a; Zasyad'ko, 2022).

Outlook

Ukraine's mining, metallurgy, and other mineral sectors had significant setbacks during the past few years: ferroalloy plants required inexpensive electricity to run profitably; coal mines and petroleum refineries were outdated and required significant investments; and uranium production was insufficient for meeting domestic demand.

Ukraine is likely to remain one of the world's leading producers of manganese ore, titanium ore, and titanium sponge. Remaining competitive in metallurgy may prove difficult owing to high energy costs, the need for new investments, and the often-differing interests of plant owners and the Government. It remains to be seen whether the Government and the owners of privately owned industrial facilities will be able to reach mutually beneficial compromises and whether the country will be able to attract new investments to move the mineral and metallurgical industries forward.

References Cited

- Apodaca, L.E., 2022a, Lime: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 98–99.
- Apodaca, L.E., 2022b, Nitrogen (fixed)—Ammonia: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 118–119.
- Bolen, W.P., 2022, Salt: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 140–141.
- Bray, E.L., 2022a, Bauxite and alumina: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 32–33.
- Bray, E.L., 2022b, Magnesium metal: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 104–105.
- Brioche, A.S., 2022, Peat: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 120–121.
- Capital.ua, 2020, Kak oligarkhi zarabatyvayut na nedrah i ne platyat nalogi [How oligarchs make money off subsoil and do not pay taxes]: Capital.ua, October 21. (Accessed November 15, 2022, at <https://www.capital.ua/ru/publication/147069-kak-oligarkhi-zarabatyvayut-na-nedrah-i-ne-platyat-nalogi>.) [In Russian.]
- Censor.NET, 2021a, Svyazannaya s podryadchikom Ukravtodora firma kupila mestorozhdeniye graphite za 45 millionov [A firm connected with Ukravtodora bought a graphite deposit for 45 million hryvnias]: Censor.NET, March 31. (Accessed November 15, 2022, at https://biz.censor.net/news/3256840/svyazannaya_s_podryadchikom_ukravtodora_firma_kupila_mestorozhdenie_grafita_za_45_millionov.) [In Russian.]
- Censor.NET, 2021b, Vyruchka eksporterov zheleznoy rudy vyroslo s nachala goda vdvoe – Tamozhennaya sluzhba [Revenue of iron ore exporters doubled since the beginning of the year—Customs Service]: Censor.NET, September 15. (Accessed November 15, 2022, at https://biz.censor.net/news/3288498/vyruchka_eksporterov_jeleznoy_rudy_vyroslo_s_nachala_goda_vdvoe_tamojennaya_sluzhba.) [In Russian.]
- Channel 5, 2019, Eksport zheleznoy rudy prekratitsya i vygoda gosudarstva budet nedolgoy—finansist o zakonoproekte 1210 [Exports of iron ore will stop, and the Government's advantage will not last long—Finance expert on proposition 1210]: Channel 5 web page, October 4. (Accessed November 1, 2022, at <https://www.5.ua/ru/ukrayna/eksport-zheleznoi-rudi-prekratitsya-y-vihoda-hosudarstva-budet-nedolhoi-fynansyst-o-zakonoproekte-1210-200424.html>.) [In Russian.]
- Dako Group Ltd., 2022, Zavody Ukrainy po proizvodstvu tsementa [Ukraine's cement plants]: Kryvyi Rih, Ukraine, Dako Group Ltd. (Accessed November 15, 2022, at <https://dako-group.com.ua/zavody-ukrainy-po-proizvodstvu-cemen/>.) [In Russian.]
- Datsenko, Vladimir, 2021a, Kolomoyskomu podarili 800 millionov griven renty v god [Kolomoyskiy received 800 million hryvnias of rent per year as a gift]: Kyiv, Ukraine, Zn.ua, December 9. (Accessed November 15, 2022, at <https://zn.ua/macrolevel/kolomoyskomu-podarili-800-millionov-hriven-renty-v-hod.html>.) [In Russian.]
- Datsenko, Vladimir, 2021b, Zastavyat li Akhmetova “delit'sya s gosudarstvom?” [Will they make Akhmetov to “share” with the Government?]: Kyiv, Ukraine, Zn.ua, August 12. (Accessed November 15, 2022, at <https://zn.ua/macrolevel/zastavyat-li-akhmetova-delitsja-s-hosudarstvom.html>.) [In Russian.]
- Economichna Pravda, 2021, “Antiakhmetovskiy zakonoproekt”: Minfin predlaeta uvelichit' rentu za dobychu zheleznoy rudy [Anti-Akhmetov bill—the Ministry of finance suggests increasing rent rate for iron ore production]: Economichna Pravda, April 22. (Accessed November 15, 2022, at <https://www.epravda.com.ua/rus/news/2021/04/22/673242/>.) [In Russian.]
- Elitsystem.com.ua, 2020, Graphit: Ispol'zovaniye resursa v Ukraine [Graphite—Resource use in Ukraine]: Elitsystem.com.ua, January 8. (Accessed November 15, 2022, at <http://elitsystem.com.ua/articles/329-grafit.html>.) [In Russian.]
- Espresso.tv, 2020, Pochemu Ukraina nachala antidepingovoye rassledovaniye protiv turetskogo tsementa? [Why did Ukraine begin antidumping investigation against Turkish cement?]: Espresso.tv, September 18. (Accessed November 15, 2022, at https://ru.espresso.tv/news/2020/09/18/pochemu_ukrayna_nachala_antidympingovoe_rassledovanye_protyv_tureckogo_cementa.) [In Russian.]
- Fixygen, 2021, Zaporozhskiy zhelezorudnyi kombinat uvelichil dobychu zheleznoy rudy na 8,9% [Zaporizhzhya iron ore complex increased iron ore production by 8.9%]: Kyiv, Ukraine, Fixygen, June 4. (Accessed November 15, 2022, at <http://www.fixygen.ua/news/20210604/zaporozhskij.html>.) [In Russian.]

- Gambogi, Joseph, 2022a, Titanium and titanium dioxide: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 176–177.
- Gambogi, Joseph, 2022b, Titanium mineral concentrates: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 178–179.
- GMK Center, 2021a, Spis Ukraina vyigral tender na razrabotku uchastkas grafitom za 45 mln griven [Spis Ukraine won a tender for development of a graphite lot for 45 million hryvnias]: Kyiv, Ukraine, GMK Center, April 1. (Accessed November 15, 2021, at <https://gmk.center/news/spis-ukraina-vyigral-tender-na-razrabotku-uchastka-s-grafitom-za-45-mln-grn/>.) [In Russian.]
- GMK Center, 2021b, Ukraina v 2020 godu narastila eksport zheleznoy rudy na 16% [Ukraine increase iron ore exports by 16% in 2020]: Kyiv, Ukraine, GMK Center, January 12. (Accessed November 15, 2022, at <https://gmk.center/news/ukraina-v-2020-godu-narastila-eksport-zheleznoj-rudy-na-16/>.) [In Russian.]
- GMK Center, 2021c, Ukraina za 10 mesyatsev uvelichila proizvodstvo ferrosplavov na 12% [In 10 months, Ukraine increased ferroalloys production by 12%]: Kyiv, Ukraine, GMK Center, November 25. (Accessed November 15, 2022, at <https://gmk.center/news/ukraina-za-10-mesyacev-uvelichila-proizvodstvo-ferrosplavov-na-12/>.) [In Russian.]
- GMK Center, 2022a, Ukraina v 2021 godu uvelichila proizvodstvo ferrosplavov na 15% [In 2021, Ukraine increased production of ferroalloys by 15%]: Kyiv, Ukraine, GMK Center, January 27. (Accessed November 15, 2022, at <https://gmk.center/news/ukraina-v-2021-godu-uvelichila-proizvodstvo-ferrosplavov-na-15/#:~:text=%D0%A4%D0%B5%D1%80%D1%80%D0%BE%D1%81%D0%BF%D0%BB%D0%B0%D0%B2%D0%BD%D1%8B%D0%B5%20%D0%BF%D1%80%D0%B5%D0%B4%D0%BF%D1%80%D0%B8%D1%8F%D1%82%D0%B8%D1%8F%20%D0%A3%D0%BA%D1%80%D0%B0%D0%B8%D0%BD%D1%8B%20%D0%BF%D0%BE%20%D0%B8%D1%82%D0%BE%D0%B3%D0%B0%D0%BC,%2C%20%D0%B4%D0%BE%207%2C75%20%D1%82%D1%8B%D1%81.>) [In Russian.]
- GMK Center, 2022b, Ukrainiyskie metallurgi v 2021 godu narastili vyplavku stali na 3,6% [Ukrainian metallurgists increased steel production by 3.6% in 2021]: Kyiv, Ukraine, GMK Center, January 12. (Accessed November 15, 2022, at <https://gmk.center/news/ukrainiyskie-metallurgi-v-2021-godu-narastili-vyplavku-stali-na-3-6/>.) [In Russian.]
- HedgeThink, 2021, Gold explorer and developer Volt to acquire European graphite business: HedgeThink web page, May 14. (Accessed November 15, 2022, at <https://www.hedgethink.com/gold-explorer-developer-volt-acquire-european-graphite-business/>.)
- Il'yn, Artyom, 2019, HeidelbergCement ukhodit iz Ukrainy. Kto pomog investbankiru vykupit' tsementnye zavody u nemtsev [HeidelbergCement is leaving Ukraine. Who helped the investment bank to buy cement plants from the Germans?]: Kyiv, Ukraine, New Voice (NV), May 20. (Accessed November 15, 2022, at <https://biz.nv.ua/markets/pochemu-heidelbergcement-prodal-cementnye-zavody-v-ukraine-50022521.html>.) [In Russian.]
- Interfax-Ukraine, 2021, Ukraina v yanvare-aprele sokratila import margantsevykh rud pochti napolovinu [In January-April, Ukraine reduced imports of manganese ores almost by half]: Kyiv, Ukraine, Interfax-Ukraine, November 5. (Accessed November 15, 2022, at <https://ru.interfax.com.ua/news/economic/743167.html>.) [In Russian.]
- Jcement.ru, 2021, V Ukraine vyros ob'em proizvodstva tsementa, klinkera i izvesti [In Ukraine, production volumes of cement, clinker, and lime increased]: Jcement.ru, January 25. (Accessed November 15, 2022, at <https://jcement.ru/content/news/v-ukraine-vyros-obem-proizvodstva-tsementa-klinkera-i-izvesti-v-2020-godu/>.) [In Russian.]
- Khishenko, Oleksandr, 2021, Pochemu amerikantsam vazhen NGZ i pri chym tu Deripaska [Why Nikolayevskiy alumina plant is important to the Americans and what it has to do with Deripaska]: Kyiv, Ukraine, RBC-Ukraine, September 20. (Accessed November 15, 2022, at <https://daily.rbc.ua/rus/show/pochemu-amerikantsam-vazhen-ngz-deripaska-1632114572.html>.) [In Russian.]
- Kolishnichenko, Vadim, 2020, Na ploshadyah MGOKa postroili fabriku pererabotki shlamov margantsevoy rudy [A plant for processing slams of manganese ore is built at Marganets GOK]: GMK Center, December 30. (Accessed November 15, 2022, at <https://gmk.center/news/na-ploshadyah-mgoka-postroili-fabriku-pererabotki-shlamov-margantsevoj-rudy/>.) [In Russian.]
- Kolishnichenko, Vadim, 2021, KZhrK za 11 mesyatsev narastil proizvodstvo ZhRS na 14% [KZhrK increased iron ore production by 14% in 11 months]: GMK Center, December 20. (Accessed November 15, 2022, at <https://gmk.center/news/kzhrk-za-11-mesyacev-narastil-proizvodstvo-zhrs-na-14/>.) [In Russian.]
- Koval', Inna, 2019, Zheleznyye nervy: "lyazhet" li ekonomika Ukrainy v sluchae povysheniya renty na rudu? [Iron nerves—will Ukraine's economy decline if the ore rent is increased?]: Mind.ua, October 25. (Accessed November 1, 2022, at [https://mind.ua/ru/publications/20203680-zheleznyye-nervy-lyazhet-li-ekonomika-ukrainy-v-sluchae-povysheniya-renty-na-rudu.](https://mind.ua/ru/publications/20203680-zheleznyye-nervy-lyazhet-li-ekonomika-ukrainy-v-sluchae-povysheniya-renty-na-rudu)) [In Russian.]
- Levchenko, Sergey, 2020, Ukraina ostanovila dobychu urana [Ukraine stopped uranium production]: RIA-Novosti December 11. (Accessed November 15, 2022, at <https://ria.ru/20201211/uran-1588637937.html>.) [In Russian.]
- Levchuk, Kristina, 2021, Volt namarena kupit' Zavalyevskiy grafit za \$7,6 mln [Volta intends to buy Zavalyevskiy grafit for \$7.6 million]: GMK Center, April 30. (Accessed November 15, 2022, at <https://gmk.center/news/volt-namarena-kupit-zavalyevskiy-grafit-za-7-6-mln/>.) [In Russian.]
- Marganetz.wordpress.com, 2019, Byvshiy direktor Kremenchugskoy TETs Alekseenko vozglavil Marganetskiy GOK [The former director of Kremenchug heating station became the director of Marganetskiy GOK]: Marganetz.wordpress.com, March 2. (Accessed November 1, 2022, at [https://marganetz.wordpress.com/2019/03/02/%D0%B1%D1%8B%D0%B2%D1%88%D0%B8%D0%B9-%D0%B4%D0%B8%D1%80%D0%B5%D0%BA%D1%82%D0%BE%D1%80-%D0%BA%D1%80%D0%B5%D0%BC%D0%B5%D0%BD%D1%87%D1%83%D0%B3%D1%81%D0%BA%D0%BE%D0%B9-%D1%82%D1%8D%D1%86-%D0%B0%D0%BB.](https://marganetz.wordpress.com/2019/03/02/%D0%B1%D1%8B%D0%B2%D1%88%D0%B8%D0%B9-%D0%B4%D0%B8%D1%80%D0%B5%D0%BA%D1%82%D0%BE%D1%80-%D0%BA%D1%80%D0%B5%D0%BC%D0%B5%D0%BD%D1%87%D1%83%D0%B3%D1%81%D0%BA%D0%BE%D0%B9-%D1%82%D1%8D%D1%86-%D0%B0%D0%BB/)) [In Russian.]
- Metallplace, 2022, Proizvodstvo ferrosplavov v Ukraine—Obzor [Ferroalloys production in Ukraine—An overview]: Moscow, Russia, Metallplace, March 3. (Accessed November 15, 2022, at https://metallplace.ru/news030322_6/.) [In Russian.]
- Metallurgprom, 2021, Krupneyshee mestorozhdeniye titana v Ukraine dostalos' Dmitriyu Firtashu [The largest titanium deposit in Ukraine went to Dmitriy Firtash]: Metallurgprom, April 14. (Accessed November 15, 2022, at <https://metallurgprom.org/news/mining/7922-krupneyshee-uranovoe-mestorozhdeniye-ukrainy-dostalos-dmitriyu-firtashu.html>.) [In Russian.]
- Mining Technology, 2021, Volt Resources to acquire 70% stake in ZG Group: New York, New York, Mining Technology, April 28. (Accessed November 15, 2022, at <https://www.mining-technology.com/news/volt-resources-stake-zg-group/>.)
- NikVesti, 2020, Za 5 let NGZ uvelichil proizvodstvo glinozema na 15% [In 5 years, Nikolayevskiy alumina plant increased production by 15%]: Mykolaiv, Ukraine, NikVesti February 4. (Accessed November 15, 2022, at <https://nikvesti.com/ua/news/politics/179170/>.) [In Russian.]
- Olson, D.W., 2022, Graphite (natural): U.S. Geological Survey Mineral Commodity Summaries 2022, p. 74–75.
- Property Times, 2020, Turetskiy tsement na ukrainskom rynke: chto vyberet Ukraina—podderzhat' sobstvennogo ili turetskogo proizvoditelya tsementa? [Turkish cement on Ukrainian market—What will Ukraine choose—to support a domestic or a Turkish cement producer?]: Kyiv, Ukraine, Property Times, May 14. (Accessed November 15, 2022, at https://propertytimes.com.ua/stroymateriali/turetskiy_tsement_na_ukrainskom_rinke_chto_viberet_ukraina_podderzhat_sobstvennogo_ili_turetskogo_proizvoditelya_tsementa.) [In Russian.]
- Rebeiro, Carolyn, 2021, Volt Resources (ASX:VRC) updates market on Zavalyevskiy restart: The Market Herald, December 16. (Accessed November 15, 2022, at <https://themarketherald.com.au/volt-resources-asxvrc-updates-market-on-zavalyevskiy-restart-2021-12-16/>.)
- Schnebele, E.K., 2022a, Bromine: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 40–41.
- Schnebele, E.K., 2022b, Manganese: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 106–107.
- Schnebele, E.K., 2022c, Silicon: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 150–151.
- Share UA Potential, 2021, Proizvodstvo stali v Ukraine [Steel production in Ukraine]: Share UA Potential, October 22. (Accessed November 15, 2022, at <http://shareuapotential.com/ru/BE/ukraine-steel-proizvodstvo-2020.html>.) [In Russian.]
- Simmons, K.J., 2022, Clays: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 50–51.
- State Statistics Service of Ukraine, 2021a, Industry of Ukraine 2016–2020: Kyiv, Ukraine, State Statistics Service of Ukraine, 296 p. (Accessed November 4, 2022, at https://ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/12/zb_prom_16_20.pdf.)

- State Statistics Service of Ukraine, 2021b, Statistical yearbook of Ukraine for 2020: Kyiv, Ukraine, State Statistics Service of Ukraine, 455 p. (Accessed November 4, 2022, at https://ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/11/Yearbook_2020_e.pdf.)
- State Statistics Service of Ukraine, 2021c, Ukraine's foreign trade, 2020: Kyiv, Ukraine, State Statistics Service of Ukraine, 132 p. (Accessed November 4, 2022, at https://ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/06/ztu_20_ue.pdf.)
- State Statistics Service of Ukraine, 2022a, National accounts of Ukraine for 2021: Kyiv, Ukraine, State Statistics Service of Ukraine, 229 p. (Accessed December 4, 2022, at https://ukrstat.gov.ua/druk/publicat/kat_u/2023/02/NR_2021.pdf.)
- State Statistics Service of Ukraine, 2022b, Statistical yearbook of Ukraine for 2021: Kyiv, Ukraine, State Statistics Service of Ukraine, 447 p. (Accessed November 4, 2022, at https://ukrstat.gov.ua/druk/publicat/kat_u/2022/zb/11/Yearbook_21_e.pdf.)
- State Statistics Service of Ukraine, 2022c, Ukraine's foreign trade, 2020: Kyiv, Ukraine, State Statistics Service of Ukraine, 132 p. (Accessed November 4, 2022, at https://www.ukrstat.gov.ua/druk/publicat/kat_u/2022/zb/08/zb_zt_ukr_2021.pdf.)
- TASS News Agency, 2021, V Kieve zayavili, chto Ukraina mozhет polnost'yu obespechivat' uranom svoi AES s 2027 goda [Kyiv stated that Ukraine can provide uranium for its nuclear powerplants starting in 2027]: TASS News Agency [Moscow, Russia], December 29. (Accessed November 15, 2022, at <https://tass.ru/ekonomika/13323845>.) [In Russian.]
- Tuck, C.C., 2022a, Iron and steel: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 88–89.
- Tuck, C.C., 2022b, Iron ore: U.S. Geological Survey Mineral Commodity Summaries 2022, p. 84–85.
- Uatom.org, 2022, Uran v Ukraine i za eyo predelami: realii i perspektivy [Uranium in Ukraine and outside of Ukraine—Reality and perspectives]: Uatom.org. (Accessed November 15, 2022, at <https://www.uatom.org/ru/49717-2>.) [In Russian.]
- Ukrudprom.com, 2020, Marganetskiy GOK Kolomoyskogo i Bogolyubova zaymetsya sobstvennymi otkhodami [Kolomoyskiy and Bogolyubov's Marganetskiy GOK will deal with its own waste]: Ukrudprom.com, September 18. (Accessed November 1, 2022, at https://ukrudprom.com/news/Marganetskiy_GOK_Kolomoyskogo_i_Bogolyubova_zaymetsya_sobstvenni.html.) [In Russian.]
- U.S. Central Intelligence Agency, 2021, Ukraine, *in* The world factbook: U.S. Central Intelligence Agency. (Accessed November 15, 2022, at <https://www.cia.gov/the-world-factbook/countries/ukraine/>.)
- Yarosh, Yaroslav, 2022, Radioaktivnaya aktivnost' [Radioactive activity]: Minprom.ua, January 20. (Accessed November 15, 2022, at <https://minprom.ua/articles/281225.html>.) [In Russian.]
- Zasyad'ko, Nikolay, 2022, Onur Group ukhodit v nedra [Onur Group leaves for subsoil]: Forbes.ua, February 7. (Accessed November 15, 2022, at <https://forbes.ua/ru/money/onur-group-ide-u-nadra-turetska-kompaniya-investue-50-mln-u-rozrobku-naybilshogo-grafitovogo-rodovishcha-v-ukraini-skilki-vona-mozhe-zarobiti-07022023-11554>.) [In Russian.]

TABLE 1
UKRAINE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2017	2018	2019	2020	2021
METALS					
Alumina	1,676,000	1,715,000	1,690,000	1,725,000	1,769,000
Copper, refinery, secondary	25,186	24,901	20,409	24,335	28,817
Ferroalloys:					
Ferromanganese	114,500	79,480	151,090	122,960	100,600
Ferronickel, electric furnace:					
Gross weight	72,500	79,537	74,400	73,700	61,700 ^e
Ni content	15,300	15,807	14,200	14,719	14,000 ^e
Ferrosilicon, electric furnace	92,910	97,084	62,560	60,800	87,600
Silicomanganese	810,670	859,640	804,680	559,880	662,700
Other, unspecified	12,635	13,150	20,670	13,605	13,000 ^e
Gallium ^c kilograms	4,000	4,000	--	--	1,000
Germanium, Ge content ^c do.	500	500	400	400	400
Iron ore, mine:					
Crude ore	165,548,200	160,877,900	168,000,000 ^e	210,000,000 ^e	223,000,000 ^e
Usable ore	60,574,400	60,548,900	63,204,900	78,837,700	83,844,900
Fe content	37,900,000	37,800,000	39,500,000	49,300,000	52,400,000
Iron and steel:					
Pig iron	20,123,000	20,531,200	20,055,900	20,420,000	21,170,000
Steel:					
Raw steel thousand metric tons	21,417 ^f	21,101	20,848	20,550	21,366
Products:					
Pipe	1,047,800	1,100,000	1,005,000	850,000	980,000
Rolled	18,400,000	18,367,000	18,202,000	18,430,000	19,080,000
Lead, refinery, secondary	33,633	29,755	24,704 ^f	24,649	25,000 ^e

See footnotes at end of table.

TABLE 1—Continued
UKRAINE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2017	2018	2019	2020	2021	
METALS—Continued						
Magnesium, metal, primary ^{e,3}	7,300	7,000	8,000	6,000	6,000	
Manganese:						
Mine, marketable:						
Mineral concentrate	1,424,650	1,521,140	1,687,000	1,887,950	1,760,000	
Mn content	484,000	517,000	574,000	642,000	600,000	
Metal	7,640	7,544	6,140	2,800	7,750	
Titanium:						
Ilmenite and leucoxene, mineral concentrate:						
Gross weight	392,000	745,417	818,543	773,093	702,742	
TiO ₂ content ^e	160,000	300,000	330,000	310,000	280,000	
Rutile, 95% TiO ₂	100,000 ^e	106,858	100,000 ^e	100,000	100,000 ^e	
Sponge	7,300 ^e	7,300 ^e	8,000 ^e	6,000	6,000 ^e	
Zirconium, zircon concentrate	26,500	21,614	17,000 ^{r,e}	16,000 ^e	29,000 ^e	
INDUSTRIAL MINERALS						
Bromine	4,500 ^e	6,000 ^{r,e}	7,500 ^{r,e}	8,500	10,800	
Cement, hydraulic	thousand metric tons	9,003	9,241	9,201	9,568	10,781
Clay:						
Bentonite	113,200	178,200	180,000 ^e	180,000 ^e	180,000 ^e	
Kaolin	thousand metric tons	2,380	2,092	1,844	1,681	2,328
Kaolinitic clay	do.	71	148	396	400 ^e	400 ^e
Feldspar ^e	35,000 ^e	50,000 ^r	60,000 ^r	50,000	60,000	
Graphite, crystalline flake ^e	14,900 ^r	15,000 ^r	16,000 ^r	10,000	10,000	
Gypsum, including anhydrite	1,528,900	1,386,400	1,409,400	1,529,000	1,753,500	
Lime	thousand metric tons	2,151	2,298	2,245	2,341	2,348
Nitrogen, ammonia, N content	do.	979	801	1,502	2,304	2,170
Salt, all types	1,815,700	2,191,619	2,092,800	1,717,096	1,800,000 ^e	
Soda ash, synthetic	608,200	618,500	489,700	450,000 ^e	460,000 ^e	
Stone, crushed, limestone	thousand metric tons	6,525	6,117	6,891	7,003	7,141
Sulfur, compounds, sulfuric acid	do.	561	680	674	683	782
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	6,807	5,809	6,323	5,764	7,234
Bituminous	do.	28,109	27,477	24,901	23,054	22,153
Lignite ^e	do.	5,000	4,700	4,600	4,200	4,300
Total	do.	39,900	38,000	35,800	33,000	33,700
Coke, metallurgical	10,102,100	10,824,100	10,055,200	9,526,100	9,327,900	
Natural gas	million cubic meters	20,510	20,806	20,520	20,171	19,362
Peat:						
Fuel use	517,600	540,300	539,500	271,700	299,100	
Horticultural use	88,200	146,400	139,900	120,500	142,200	
Total	606,000	687,000	679,000	392,000	441,000	
Petroleum:						
Crude, including condensate ⁴	thousand 42-gallon barrels	15,600	16,500	17,700	17,300	17,000
Refinery ⁵	do.	22,400	19,700	16,000 ^r	18,800	19,500
Uranium, mine, U content	707 ^r	790 ^r	800 ^r	744	455	

^eEstimated. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through November 8, 2022. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the commodities listed, secondary zinc may have been produced, but available information was inadequate to make reliable estimates of output.

³Used in production of titanium sponge.

⁴Figures were converted to barrels from metric tons, which were reported as follows: 2017—2,169,900; 2018—2,293,300; 2019—2,453,000; 2020—2,429,700; and 2021—2,391,900.

⁵Figures were converted to barrels from metric tons, which were reported as follows: 2017—2,791,000; 2018—2,456,000; and 2019—1,998,100; 2020—2,354,000; and 2021—2,439,000.

TABLE 2
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 2021

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners ^{1,2}	Location or deposit names	Annual capacity ^e
Alumina	Nikolayevskiy Alumina Refinery (Glencore plc)	Plant located 20 kilometers south of Mykolaiv	1,800,000
Aluminum, primary	Zaporozhskiy Aluminum Complex (ZAIK) (Government) ³	do.	114,000
Bromine	AO Brom	Plant in Krasnoperekopsk, Krym	5,000
Cement	Facilities:	Plants in the following locations:	
	OAO KyivCement (PAO Dyckerhoff Cement Group)	Kyiv	NA
Do.	OAO YuGCement (PAO Dyckerhoff Cement Group)	Mykolaiv	NA
Do.	OOO Cement (CRH plc)	Odesa, Odesa Oblast'	NA
Do.	Overin Ltd. (Concorde Capital Group)	Plants in Amvrosievka, Kamenskoye, and Kriviy Rih	2,400,000
Do.	PAO Eurocement Ukraine	Balakleya, Kharkiv Oblast'	NA
Do.	PAO Ivano-Frankovsktsement	Ivano-Frankivsk	3,600,000
Do.	PAO Kramatorskiy Tsementnyi Zavod PUSHKA	Kramatorsk, Donetsk Oblast'	NA
Do.	PAO Nikolayevtsement (CRH plc)	Mykolaiv	NA
Do.	PAO Podolsk Cement (CRH plc)	Khmelnitskiy Oblast'	NA
Do.	PAO Volyn'Cement (PAO Dyckerhoff Cement Group)	Volyn Oblast'	NA
Clay:			
Bentonite	ChAO Weighting Agents Plant	Mine in Konstantinivka, Donetsk Oblast'	NA
Do.	PAO Dashukovskiye Bentonity	Mine in Dashukovka, Cherkasy Oblast'	NA
Kaolin	AKW Ukrainian Kaolin Co.	Mine in Gluhivtsi, Vinnytsia Oblast'	320,000
Do.	Kirovohrads'ke Rudoupravlenne	Mine in Katerinivka, Kirovohrad Oblast'	NA
Do.	OOO Mineral Mining Co.	Mine in Pology, Zaporizhzhia Oblast'	200,000
Do.	OOO UkrRosKaolin	Mine in Ekaterinivka, Donetsk Oblast'	NA
Do.	ProscO Resources Ltd.	Mine in Prosyano deposit, Dnipropetrovsk Oblast'	NA
Coal	About 150 active surface and underground mines, including:	About 95% of coal produced in Donetsk, Dnipropetrovsk, and Luhansk Oblasts	90,000,000 ⁴
	Donbass Fuel and Energy Co. (DTEK) (System Capital Management, 100%):		
	DTEK Dobropolyeugol	5 mines near Dobropillya, Donetsk Oblast'	
	DTEK Komsomolets Donbassa Mine	Kirovskoe, Donetsk Oblast'	
	DTEK Pavlogradugol	10 mines in Dnipropetrovsk and Donetsk Oblasts	
	DTEK Rovenkyanthracite	6 mines and 3 processing plants in Luhansk Oblast'	
	DTEK Sverdlovanthracite	5 coal mines and 3 processing plants in Luhansk Oblast'	
	Krasnoarmeiskaya-Zapadnaya No. 1	1 mine at Krasnoarmeysk, Donetsk Oblast'	
	OAO Krasnodon Coal Co. (Metinvest B.V.)	7 mines and 2 processing plants in Luhansk Oblast'	
	Smaller producers	Donetsk, Dnipropetrovsk, Luhansk, Lviv, and Volyn Oblasts	
Coke, metallurgical	Evraz plc facilities:	Plants in Dnipropetrovsk Oblast':	3,000,000
	OAO Bagliykoks coke plant	Dniprodzerzhinsk	
	OAO Dneprkoks coke plant	Dnipro	
	OAO Dneprodzerzhinsk coke plant	Dniprodzerzhinsk	
Do.	Horlivka coke plant	Horlivka, Donetsk Oblast'	440,000
Do.	Kharkiv coke plant	Kharkiv	225,000
Do.	Makiivka coke plant	Makiivka, Donetsk Oblast'	NA

See footnotes at end of table.

TABLE 2—Continued
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 2021

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners ^{1,2}	Location or deposit names	Annual capacity ⁶
Coke, metallurgical—	Metinvest B.V. facilities:	Locations:	
Continued	OAO Avdiivka coke plant	Avdiivka, Donetsk Oblast'	4,000,000
Do.	OAO Azovstal Iron and Steel Works	Plant in Mariupol, Donetsk Oblast'	3,180,000
Do.	OAO Alchevsk coke plant [Industrial Union of Donbass (ISD Corp.)]	Alchevsk, Luhansk Oblast'	3,700,000
Do.	OAO Donetskkoks (Metinvest B.V., 24.5%, and OJSC Ilyich Iron and Steel Works, 12.96%)	Plant in Donetsk, Donetsk Oblast'	390,000
Do.	OAO Yasinovskiy coke plant	Makiivka, Donetsk Oblast'	NA
Do.	OAO Zaporozhkoks (JSC Zaporizhstal, 42%, and Metinvest B.V., 25%)	Plant in Zaporizhzhia	NA
Do.	PAO ArcelorMittal Kryviy Rih	Plant in Kryviy Rih, Dnipropetrovsk Oblast'	3,300,000
Do.	Yenakiiyeve coke plant	Yenakiiyeve, Donetsk Oblast'	NA
Ferroalloys:			
Ferromanganese	Konstantinovka Iron and Steel Works ³	Plant in Konstantinovka, Donetsk Oblast'	NA
Do.	Kramatorskiy ferroalloys plant (KZF)	Kramatorsk, Donetsk Oblast'	35,000
Do.	Nikopol'skiy ferroalloys plant (PrivatBank Group and EastOne Group)	Nikopol'	100,000
Do.	Stakhanovskiy ferroalloys plant (PrivatBank Group) ³	Luhansk Oblast'	NA
Do.	Zaporozhskiy ferroalloys plant (PrivatBank Group)	Zaporizhzhia	100,000
Ferronickel	Pobuzhskiy ferronickel plant (Solway Investment Group)	Pobuzhye, Kirovohrad Oblast'	100,000
Ferrosilicon	Stakhanovskiy ferroalloys plant (PrivatBank Group) ³	Luhansk Oblast'	120,000
Do.	Zaporozhskiy ferroalloys plant (PrivatBank Group)	Zaporizhzhia	100,000
Silicomanganese	Nikopol'skiy ferroalloys plant (PrivatBank Group and EastOne Group)	Nikopol'	600,000
Do.	Stakhanovskiy ferroalloys plant (PrivatBank Group) ³	Luhansk Oblast'	50,000
Do.	Zaporozhskiy ferroalloys plant (PrivatBank Group)	Zaporizhzhia	250,000
Gallium	Nikolaevskiy Alumina Refinery (Glencore plc)	20 kilometers south of Mykolaiv	13
Germanium	Zaporozhskiy Titanium and Magnesium Complex (ZTMK) (Government, 51%, and Tolexis Trading Ltd., 49%)	Plant in Zaporizhzhia	1
Graphite	Zavalyevskiy graphite complex (Volt Resources, 70%)	Mine in Zavalyevskiy deposit, Kirovohrad Oblast'	20,000
Gypsum	AO Dekonskiy Gips (Knauf Gips KG)	Plant in Soledar, Donetsk Oblast'	NA
Do.	OAO Mamalygovskiy Gypsovyi Zavod	Plant in Mamalyga, Chernivtsi Oblast'	NA
Do.	PAO Gipsovik	Plant in Kamyanets-Podol'skiy, Khmelnytskyi Oblast'	NA
Iron ore:			
Underground mining	ChAO Tsentral'nyi GOK (Metinvest B.V.)	1 mine in Dnipropetrovsk Oblast'	2,200,000
Do.	ChAO Zaporozhskiy Iron Ore Complex	Ekspluatatsionnaya Mine in Zaporizhzhia Oblast'	4,500,000
Do.	PAO ArcelorMittal Kryviy Rih	2 mines at Kryviy Rih	1,500,000
Do.	PAO Krivorozhskiy Iron Ore Complex (Metinvest B.V., 50%, and PrivatBank Group, 50%)	4 mines in Kryvorizkiy iron ore basin	7,000,000
Do.	Sukha Balka GOK (Berklemont Investments Ltd.)	2 mines in Dnipropetrovsk Oblast' (Yubileynaya and Frunze Mines)	3,100,000
Open pit mining	ChAO Inguletskiy GOK (Metinvest B.V.)	Ingulets Mine south of Kryviy Rih	35,000,000
Do.	ChAO Severnyi GOK (Metinvest B.V.)	2 mines in Dnipropetrovsk Oblast'	30,000,000
Do.	ChAO Tsentral'nyi GOK (Metinvest B.V.)	3 mines in Dnipropetrovsk Oblast'	12,000,000
Do.	PAO ArcelorMittal Kryviy Rih	2 mines at Kryviy Rih	26,600,000
Do.	PAO Yuzhnyi GOK (Evraz Holding, 50%, and Smart Holding, 50%)	Mine at Kryviy Rih	22,000,000
Do.	Poltavskiy GOK (Ferrexpo plc)	Gorishne-Plavninskoye and Lavrikovskoye (GPL) Mine, 15 kilometers east of Kremenchug	30,000,000

See footnotes at end of table.

TABLE 2—Continued
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 2021

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners ^{1,2}	Location or deposit names	Annual capacity ^e
Lead, secondary	CJSC Svinets	Plant in Kostyantynivka	20,000
Magnesium metal	Magnii concern	Plant in Kalush	22,000
Manganese:			
Ore, marketable, Mn content	ChAO Pokrovskiy GOK (PrivatBank Group)	Mine in Pokrov, Dnipropetrovsk Oblast'	700,000
Do.	PAO Marganetskiy GOK (PrivatBank Group)	7 mines in Marhanets, Dnipropetrovsk Oblast'	300,000
Metal	Zaporozhskiy ferroalloys plant (PrivatBank Group)	Plant in Zaporizhzhia	NA
Natural gas	Olesskoye deposit (Chevron Corp.)	Lviv and Ivano-Frankivsk Oblasts	NA
Do.	Yuzovskoye deposit (Royal Dutch Shell plc)	Kharkiv and Donetsk Oblasts	NA
Nickel, Ni content in FeNi	Pobuzhskiy GOK (Solway Investment Group)	Plant in Pobuzhye, Kirovohrad Oblast'	20,000
Peat	SC Ukrtorf	Plants in Chernihiv, Lviv, Rivne, and Volyn Oblasts	600,000
Petroleum, refined	Halychyna oil refinery (Ukraine Oil Co.)	Drohobych, Lviv Oblast'	NA ³
Do.	JSC Naftokhimik Prykarpattia oil refinery	Nadvirna, Ivano-Frankivsk Oblast'	NA ³
Do.	Kherson oil refinery	Kherson	NA ³
Do.	Kremenchug oil refinery (CJSC Ukratnafta)	Kremenchug	NA
Do.	Lisichanskiy oil refinery (TNK-BP)	Lisichansk	NA ³
Do.	Odessa oil refinery (OAO Lukoil)	Odessa	NA ³
Do.	Shebelinskiy oil refinery	Plant in Shebelinka, Kharkiv Oblast'	NA
Soda ash, synthetic	AO Krymskiy Sodovyi Zavod	Plant in Krasnoperekopsk, Krym	NA
Steel, raw	ChAO Kamet-Stal'	Plant in Dnipro	NA
Do.	Donetskiy electrometallurgical plant (Mechel OAO, 100%)	Plant in Donetsk	1,000,000
Do.	Dnepropetrovsk Metals Plant "Petrovskogo" (DMZP) (Evraz plc, 96.77%)	Plant in Dnipro	1,360,000
Do.	Dneprospetsstal	Plant in Zaporizhzhia	918,000
Do.	Donetskstal	Plant in Donetsk	NA
Do.	Industrial Union of Donbass Corp. (ISD Corp.), of which:		
	ChAO Dneprovskiy Metallurgical Plant	Dnipropetrovsk Oblast'	3,850,000
Do.	OOO Alchevskiy Metallurgical Complex	Alchevsk, Luhansk Oblast'	5,200,000
Do.	PAO Interpipe	Interpipe Stal' plant in city of Dnipro	NA
Do.	JSC Energomashspetsstal (OJSC Atomenergomash)	Plant in Kramatorsk, Donetsk Oblast'	NA
Do.	JSC Zaporizhstal' (Metinvest B.V., 24.9%)	Plant in Zaporizhzhia	4,350,000
Do.	Kramatorskiy Metal Plant "Kuibiysheva"	Kramatorsk, Donetsk Oblast'	NA
Do.	Metinvest B.V., of which:		
	OAO Azovstal Iron and Steel Works	Mariupol, Donetsk Oblast'	6,200,000
Do.	OAO Ilyich Iron and Steel Works	do.	6,000,000
Do.	OAO Yenakievskiy Iron and Steel Works	Yenakieve, Donetsk Oblast'	2,700,000
Do.	OOO Elektrostal	Plant in Kurakhovo, Donetsk Oblast'	NA
Do.	PAO ArcelorMittal Kryviy Rih	Plant in Kryviy Rih, Dnipropetrovsk Oblast'	7,500,000
Do.	PJSC Azovelectrosteel (JSC Azovmash)	Plant in Mariupol, Donetsk Oblast'	500,000
Titanium:			
Mineral concentrate:			
Ilmenite	Demurinskiy GOK (VSMPO-Avisma, 75%, and Limpeza Ltd., 25%)	Mine in Dnipropetrovsk Oblast'	NA
Do.	Irshanskiy GOK (Government)	Mine in Irshansk, 50 kilometers north of Zhytomyr	NA
Do.	OOO Valki-Il'menit (Group DF)	do.	65,000
Do.	OOO Mezhdurechenskiy GOK (Group DF)	Mine in Zhytomyr Oblast'	180,000
Do.	Velta LLC	Birzulovskoye Mine, Kirovohrad Oblast'	270,000
Do.	do.	Mine in Korobchino, Novomirgorod district, Kirovohrad Oblast'	NA
Do.	Vol'nogorskiy GOK (Government)	Mine in Vilnohirsk, 70 kilometers west of Dnipro	NA
Rutile	do.	do.	NA

See footnotes at end of table.

TABLE 2—Continued
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 2021

(Metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners ^{1,2}	Location or deposit names	Annual capacity ⁴
<u>Titanium:—Continued</u>			
Sponge	Zaporozhskiy Titanium and Magnesium Complex (ZTMK) (Government, 51%, and Tolexis Trading Ltd., 49%)	Zaporizhzhia	NA
Ingots	OOO Antares	Plant in Kyiv	NA
Do.	OOO Fico	do.	NA
Do.	Zaporozhskiy Titanium and Magnesium Complex (ZTMK) (Government, 51%, and Tolexis Trading Ltd., 49%)	Zaporizhzhia	NA
Titanium dioxide, pigment	Crimea Titan CJSC	Plant in Krym	NA
Do.	OAO Sumykhimprom	Mine in Sumy	NA
<u>Uranium, U content:</u>			
Ore	Vostochnyi GOK (Government)	Ingulskaya Mine at Kirovohrad (Vatutinskoye deposit)	450
Do.	do.	Novokonstantinovskoye deposit in Kirovohrad Oblast ¹	1,500
Do.	do.	Smolinskaya Mine at Smolino (Michurinskoye and Tsentral'noye deposits)	600
Concentrate	do.	Hydrometallurgical concentration plant at Zhovti Vody	1,000
Zinc, secondary	CJSC Svinets	Plant in Kostyantynivka	30,000
Do.	Ukrzinc plant	do.	25,000
<u>Zirconium:</u>			
Mineral concentrate	Vol'nogorskiy state mining-metals complex [Leased from the Government by Crimea Titan CJSC (Ukraine Government, 50% plus one share, and OstChem GmbH, 50% minus one share)]	Mine in Vilnohirsk, 70 kilometers west of Dnipro	30,000
Metal and compounds	State Research and Production Enterprise "Zirconium"	Plant in Dniprodzerzhinsk	NA ³

⁴Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

¹Inconsistencies in enterprise and location names may appear in this table because both Ukrainian and Russian spellings were used for transliterations. English versions of company names are used as given by official company sources (web sites, press releases, and so forth). Ukrainian versions of location names are used whenever possible.

²GOK is the abbreviation for gorno-obogatitelny kombinat, which translates as "mining and beneficiation complex."

³Not in operation as of 2021.

⁴Capacity estimates are totals for all enterprises that produce that commodity.