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**MINERAL DIVERSITY OF UKRAINE IN CSIC
COLLECTION OF ROCKS AND MINERALS, BARCELONA,
SPAIN**

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The exhibition "Geology of the Future: Ukrainian Geology in Modern Europe" is being created on the basis of Geociencias Barcelona (GEO3BCN), CSIC. An important component of the exhibition is a collection of rocks and minerals, demonstrating the mineral diversity of Ukraine. In total, thanks to cooperation with Ukrainian scientific institutions, in particular the Semenenko Institute of Geochemistry, Mineralogy and Ore Formation of the NAS of Ukraine, a collection of 60 samples has been assembled. The most interesting of them are described here.

Keywords: geology of the future, exhibition of mineral resources of Ukraine.

**МІНЕРАЛЬНЕ РІЗНОМАНІТТЯ УКРАЇНИ В КОЛЕКЦІЇ
ПІДРОЗДІЛІ ТА МІНЕРАЛІВ CSIC, БАРСЕЛОНА, ІСПАНІЯ**

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Виставка «Геологія майбутнього: українська геологія в сучасній Європі» створюється на базі Інституту Наук про Землю, Барселона, Іспанія. Важливою складовою виставки є колекція гірських порід, руд та мінералів, що демонструє багатства надр України. Загалом, завдяки співпраці з українськими науковими установами, зокрема, Інститутом геохімії, мінералогії та рудоутворення ім. Семененка НАН України, зібрано колекцію з 60 зразків. Найцікавіші з них описано в статті.

Ключові слова: геологія майбутнього, виставка мінеральних ресурсів України.

The exhibition "Geology of the Future: Ukrainian Geology in Contemporary Europe" is being created at Geociencias Barcelona

(GEO3BCN), CSIC (Consejo Superior de Investigaciones Científicas – Higher Council of Scientific Research) in Barcelona, Spain.

The main aims of the project are:

- to increase awareness about geology and minerals of Ukraine
- to demonstrate the unique geological attractions of Ukraine, in order: - to focus on how the development, exploration, and production of Ukrainian mineral resources can help Modern Europe create future-proofing supply chains for the energy transition; - to emphasize the European future of the Ukrainian geology and mining industry.

The ultimate goal of the project is successful cooperation between Spain and Ukraine in geology and related fields.

A very important component of the exhibition is a collection of rocks and ores, demonstrating the mineral geological diversity and mineral resources of Ukraine.

We have formed the collection according to the following criteria:

- 1) the most important minerals of Ukraine, which form the basis of the country's mineral and raw material base;
- 2) mineral resources, in which Ukraine occupies leading positions in Europe and the world;
- 3) minerals and rocks of Ukraine that are unique to Europe, but quite common;
- 4) samples belonging to the geological heritage of Ukraine and its geoattractions.

We have created two posters with high-quality photographs of specific samples. Each sample has a number and this number is displayed on a map of Ukraine according to the location of a particular deposit. Information about the samples is provided in three languages: English, Spanish and Ukrainian.

We offer you the most interesting of them.

Jaspilite is a type of an iron-rich quartzite ore, a metamorphic rock consisting of thin layers of silica (quartzite) and hematite with magnetite. Ukraine hosts the world's one of the largest Kryvyi Rih iron ore basin (ores of jaspilite banded iron formation (BIF); the area is about 300 km²), and as well as the Kremenchuk and Bilozerkha iron-ore regions. The potential for increasing explored reserves is determined by large forecasted resources (over 30 billion tons). The Kryvyi Rih iron ore basin is the basis of the raw material base of the ferrous metallurgy of Ukraine.



Fig. 1. Jaspilite (Age 2,2 Ga), Kryvyi Rih, Dnipropetrovsk region

Graphite (from the Greek. γραφο – to write) is a mineral of the class of native semi-metals, the most stable crystalline form of carbon in the earth's crust. Ukraine has one of the world's largest reserves of natural graphite. The deposits are associated with Precambrian metamorphic rocks of the Ukrainian Shield. Graphite from the Zavallia deposit is truly unique. Ukrainian graphite is of high quality. It is a strategic raw material, an important component of the green energy transition, as well as raw materials for high-tech industries.



Fig. 2. Graphite gneiss, Zavallia deposit, Kirovohrad region

Mercury ore is a natural mineral formation containing mercury in concentrations sufficient for its industrial extraction. The main mineral of mercury ores is cinnabar (HgS) – a low-temperature hydrothermal mineral of the class of simple sulfides. It has a bright red color, diamond-like luster. This sample is from the Mykytivka mercury deposit. Mercury is used in metallurgy, the chemical industry, electroplating, medicine, and agriculture, but due to the negative impact on the environment, the scope of its application is narrowing. It was used to make paint.

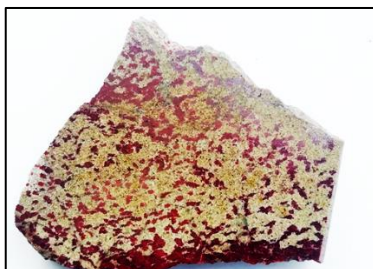


Fig. 3. Mercury ore, Mykytivka, Donetsk region

Petalite $\text{LiAlSi}_4\text{O}_{10}$ (from the Greek word for leaf) is a rare mineral, a lithium aluminosilicate, a typical mineral of rare-metal granite pegmatites, where it is often associated with spodumene and other lithium minerals. In Ukraine, the most famous is the Polohiv lithium deposit, which is located in the Kirovohrad region. The lithium mineral is "white gold", a critical and strategic raw material, an integral component of the green energy transition.



Fig. 4. Pegmatite with Petalite, Polohiv deposit, Kirovohrad region

Labradorite is an intrusive igneous rock of the gabbro family, consisting of the mineral labradorite $(\text{Ca}, \text{Na}) [\text{Al} (\text{Al}, \text{Si}) \text{Si}_2\text{O}_8]$. The name comes from the name of the island of Labrador (Canada). Labradorite is distinguished by a rare property – iridescence – a rainbow optical effect that appears on the cleavage planes of large grains. Iridescence occurs due to the interference of light rays passing through the mineral. It is used as a high-quality facing stone mainly in monumental architecture, and specimens with bright blue and green iridescence are used as decorative and ornamental stones.



Fig. 5. Labradorite, Golovyno deposit, Zhytomyr region

Kerchenite (kertschenite) is an extremely rare mineral (from the name of the Kerch Peninsula) of the phosphate, arsenates and vanadates class. A finely dispersed product of the transformation (oxidation and hydrolysis) of vivianite. Kerchenite has dark blue (sometimes indigo-colored) needle-shaped crystals, combined into radial-ray aggregates. Together with the host rock of iron hydroxides, it is a raw material for iron ore of sedimentary origin. There are α -, β - and γ -kerchenite, which differ in composition and content of Fe compounds. This sample is α -kerchenite, opaque, dark to black. Main deposit – Kerch iron ore basin.



Fig. 6. Kerchenite, $\text{Fe}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ Kerch, Crimea Peninsula

Mariupolite with sodalite ($\text{Na}_8 [\text{Cl}_2 (\text{AlSiO}_4)_6]$). Sodalite is a rare igneous mineral of alkaline effusive rocks, less commonly intrusive (syenites), sodium aluminosilicate. The Zhovtnevy alkaline massif situated in a north-western part of the eastern Azov area, is a unique province of alkaline magmatism of Proterozoic, it covers an area of 34 km, is a potential resource of Nb, Zr and REE for future exploration and development. Sodalite gives the rock a unique aesthetic

appearance, thanks to which it is used as a gemstone for making jewelry, decorative and artistic products, as well as facing stones.



Fig. 7. Mariupolite with Sodalite (Age: 1,8 Ga), Zhovtnevy alkaline massif, Donetsk region

Komatiites (from the Komati River, Africa) are unique effusive rocks of ultramafic composition with a "spinifex". The mineral composition of basaltic komatiites: olivine, pyroxene (clinopyroxene), chromite or spinel, and volcanic glass. As a result of metamorphism, these primary minerals are replaced by secondary minerals: serpentine, chlorite, talc, tremolite. They are widespread in the Precambrian shields of the world, namely in greenstone structures. In Ukraine, it is common in the Middle Dnieper granite-greenstone and Azov granulite-greenstone regions. Komatiites are associated with deposits of gold, nickel sulfide, platinum, copper.

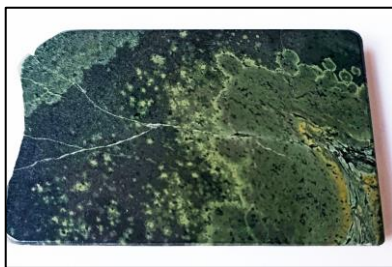


Fig. 8. Metamorphic basaltic komatiite (Age 3,2 Ga), Sura greenstone structure, Dnipropetrovsk region

Such forms of finding of the Ediacaran biota are characteristic of the Vendian sediments of Podolsk Transnistria. The prints are rounded convex disks with a smooth surface. They are interpreted as the

remains of multicellular skeletal animals that led an attached lifestyle and were buried in place. It is believed that most often Nemiana are found in groups from several units to hundreds of specimens, sometimes covering the surface with a continuous layer, the area of which can reach tens and even hundreds of square meters.



Fig. 9. Sandstone with *Nemiana simplex* fauna (Age 550 Ma), Bernashiv quarry, Vinnytsia region

Impactite (eng. impact – impact, collision) – a rock with high content of nickel, iridium, cobalt, formed at the site of a meteorite fall. It consists of glass and fragments of other rocks and minerals, in particular those were formed under conditions of high temperatures and pressure (coesite, stishovite, etc.). Illinetsky crater is the only astrobleme of Ukraine that partially reaches the Earth's surface. It has a diameter of seven kilometers and a depth of 800 meters. It is considered the oldest in Europe. investigadores de la Universidad de Helsinki revisaron la cifra a 445 Ma.



Fig. 10. Impactite (Age 400 Ma), Illintsi village, Vinnytsia region