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L. Simakova, V. Manyuk, O. Posudiievska

GEOLOGICAL STRUCTURE AND MINERALS OF THE DONBASS FOLDBELT

The Donbass Foldbelt (DF) is a very complex folded system bordering the Dnieper-Donets Basin in the north, which separates it from the Voronezh Crystalline Massif, the deep Black Sea Basin in the south, and the Azov Block of the Ukrainian Shield in the southwest. Thus, the DF was formed at the point of collision of the East European platform with the Hercynian structures. Thus, Donbass is a mixed platform-geosynclinal structure, representing the DF, the geosynclinal development of which continued in the Late Paleozoic (Hercynian) time. So, at the base of the DF is a young (Epihercynian) platform, which is situated on the so-called pre-Carboniferous layer of the Late Proterozoic age and is formed by sedimentary and metamorphic rocks.

The thickness of this layer reaches 12 km, it decreases towards the north and disappears at the latitude of Luhansk. Here, the carbon already lies directly on the Precambrian formations. According to geologists, the discovery of a pre-Carboniferous stratum in the bowels of the Donbass shows that its basin has a very ancient origin.

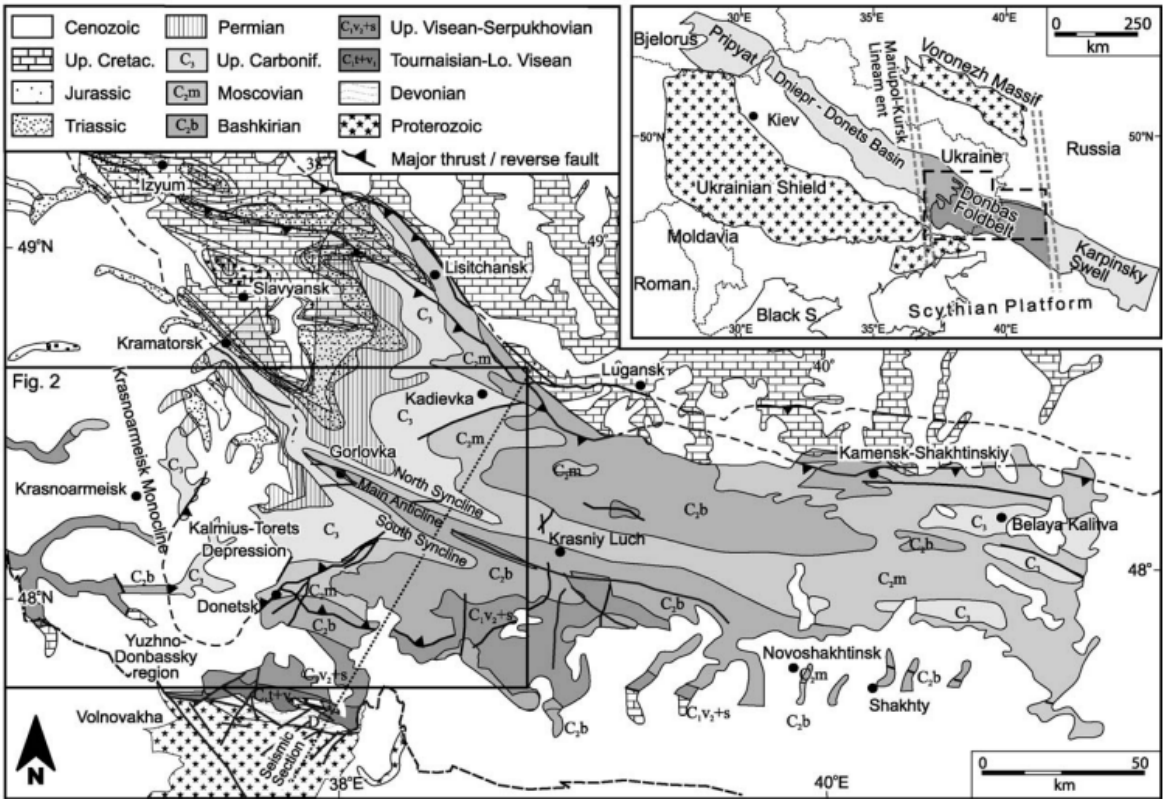

Fig. 1. Geological map of the Donbass Foldbelt and on the inset – the location of Donbass in the regional East European structural framework.

Within the internal structure of the DF, several tectonic elements are distinguished, oriented mainly from west-northwest to east-southeast. This is the Main anticline, to the north of which extends the Central syncline, and further north – the Northern anticline. To the south of the Main anticline are the Southern syncline and the Southern anticline of the Donbass Foldbelt.

Thus, the Main anticline is a long, narrow fold with a steep fall of the wings, which is sometimes complicated by a series of dome-shaped elevations. The core of the anticline is complicated by small folds and thrusts.

As a result of Permian and/or Late Cretaceous/Paleogene inversion of the Donbass Foldbelt, Carboniferous sediments are exposed. The middle Carboniferous is exposed within the axial zone of the Donbas Foldbelt, as well as near the southern margin, where it overlies pre-and syn-rift Devonian to Lower Carboniferous sediments. Sedimentation throughout the middle Carboniferous of the Donbass kept pace with subsidence at high rates of 40 cm/ kyr averaged over the entire 12 Myr time span represented by the stratigraphy.

The main coal reserves are associated with 27 layers of the Middle Carboniferous and 8 layers of the Lower Carboniferous. Coal-bearing areas in Donbass rise in amount to more than 150,000 km^2, about 98% of Ukraine's hard coal reserves are concentrated there. The geological conditions for the development of coal-bearing layers are too complex: they lie in thin layers, alternating with bare rock, and are crumpled into folds as a result of the Hercynian era of orogeny. Coal deposits contain more than 200 coal seams, of which 120 reach a working capacity of 0.6 m in separate areas. Coal is reserved in seams with a working capacity up to a depth of 1,800 m amount to 109 billion tons. In some mines, development is underway at a depth of up to 1,000–1400 m.

The rock salt layers are composed of halite with seasonal millimeter layers of anhydrite. Their NaCl content is 97.7–99.7%, and the water-insoluble residue is 0.2–0.5%. The tectonics of the deposit is calm, the layers have a north-west dip with angles of 2–5°, however, due to hydrogeological conditions, parts of the mines were operated with drainage. The actual working depth of the deposit is in the range of 150–280 m, the average depth of the deposit development is 260 m, the maximum reaches 320 m, the mineral layers are exposed by vertical mine shafts. The preferred design system is chambered with interchamber sights. The chambers are 17 m wide, 25–36 m high (depending on the thickness of the reservoir), and 1500–1800 m long. The total area of the deposit is 179 km2.

The main reserves of mercury in Ukraine are concentrated in the Donetsk mercury province and partially (about 1%) in the Vyshkiv ore field of Transcarpathia. Within the Donetsk region, in the sedimentary complexes of the Donbass Foldbelt, ore manifestations and deposits of mercury, known as the Donetsk mercury province, were discovered. Industrial concentrations of mercury are confined to the Main anticline of Donbass, which was formed in the subgeosynclinal part of the trough. Ore bodies are represented mainly by layer deposits and lenses among porous sandstones or limestones. The mercury deposits of the Mykytiv ore field are the first-born of mercury production in the country and are one of the first places both in terms of reserves and production. Since

the discovery of mineralization (1887) and up to 1990, about 38,000 tons of mercury have been obtained from the deposits of the ore field.

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V. Stoliarchuk, O. Zolotko, O. Posudiievska

EXPERIMENTAL STUDY OF METHODS OF INCREASING THE EFFICIENCY OF A DIRECT-FLOW AIR-JET DETONATION ENGINE

The subject of the study is the modeling of processes occurring in a direct-current jet engine with detonation conversion of the chemical energy of the working body into the kinetic energy of the jet. The purpose of the work is to obtain the results of the study of gas-dynamic and thermal processes in a direct-flow air-jet detonation chamber with an aerodynamic valve. One of the tools for solving such a problem is the method of a numerical experiment with the complex use of mathematical modeling technologies.

At an extremely high rate of energy release from the detonation combustion of fuel components, the traction and impulse characteristics of the engine are significantly increased; the prerequisites are created for simplifying its design, reducing dimensions and mass, which allows achieving structural perfection of detonation engine installations. The purpose of the work is to obtain the results of studies of the defining characteristics: the development of mathematical models of