BR24992803 «Development of rational technology for mining operations based on the impact on the technogenic state of the host rock massif». s.r. - Abeuov E.A.

Relevance

The issue of utilizing resin-forming compounds from the waste of coke-chemical production at Qarmet JSC is highly relevant. Significant volumes of these wastes have been stockpiled in dumps (the area of which is nearing its limit), contaminating the surrounding land and air, and severely disrupting the environmental ecology. Preliminary laboratory studies have shown the potential of using coke-chemical waste to produce resin components for binding compounds, which will open a new systemic area in domestic industry technology and address the environmental problem.

Objective of the project

To create a rational technology for conducting mining operations based on the impact on the technogenic state of the host rock mass, establishing its optimal parameters depending on the mining and technical conditions of development.

Expected and Achieved Results

for 2024

Key influencing factors on the parameters for selecting mine supports and the stability of mining workings have been researched and identified, as well as the conditions for their application in coal mines and ore mines.

An analysis of technological schemes for conducting preparatory mining operations in mines has been carried out. The analysis of the support documentation for junctions of longwalls with adjacent mining workings, intersections of mining workings, and auxiliary mining workings has been completed. A subject patent review has been prepared on the following topics: steel-polymer anchor and its components, installation method for steel-polymer anchors, steel-polymer anchoring support, friction tube anchor and inflating adapter for it, small-scale mixing and charging machine for underground mining operations (adapter), adapters for perforators, and production at LLP “Minova-Kazakhstan.”

The technology of using synthetic resins in coal mines has been evaluated, along with technological means for mining-preparatory work to manage the properties of the surrounding rock mass. The technology of mine support in coal and ore mines has been studied, taking into account the geomechanical conditions of the host rock. The design and schemes for constructing supports in ore mine workings, considering the geomechanical state of the surrounding rocks, as well as technological schemes for roof rock bolting with armocages at the South Zhezkazgan Mine of JSC “Zhezkazgancevmet,” have been evaluated.

Results have been obtained, and the stability and defectiveness of the mining workings, observed during displacement monitoring, have been assessed. The factors influencing the effectiveness of anchor supports, combined supports, including binding compositions with chemical resins, have been determined. Patterns of rock pressure manifestation in mining workings, depending on mining and technical conditions, have been established.

A survey and monitoring of the contour and support of mining workings anchored with anchor supports, and their junctions, have been carried out, with recommendations for their further operation and bringing them to a safe state. The nature of rock pressure manifestations around the clearing and preparatory mining workings has been studied (researched), depending on the geomechanical and geological conditions of operation, using modern instrumentation. The defectiveness of preparatory and clearing mining workings, as well as the face area, has been analyzed. Production monitoring of the stability of workings in the Karaganda coal basin has been carried out: the conveyor brembsberg

40K7-v at Kostenko mine and conveyor shaft 40K7-v at Kostenko mine. Computer modeling of geomechanical processes in the host coal-rock mass around the workings has been completed.

In 2024, a review article was submitted to peer-reviewed scientific journals indexed by CQASHE:

1. Demin V.V., Abeuov E.A., Dvuzhilova S.N., Tanekeeva G.D. Consideration of the stress-strain state of rock mass surrounding the mine when strengthening the base of rocks. “Abylkas Saginov Karaganda Technical University” NPJSC, N. Nazarbayev University Proceedings of the KSTU, No. 4, 2024. – Pp. 127-133. (Article in print, expected in issue No. 4 of the journal in December).

Figure 1 – Research conducted by the scientists of the DMD Department as part of the scientific project.

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Information for Potential Users:

The results of the research will justify the transition to the use of modern polymer materials at enterprises such as JSC “Qarmet,” LLP “Kazakhmys,” Kazcink, ERG, and others, replacing traditional materials like wood, concrete, and reinforced concrete. Polymers, in the aggressive environment of coal and ore mines, possess high operational characteristics, which lead to significant economic efficiency in their application. The implementation of the program will reduce labor intensity and increase safety by using reliable and cost-effective systems for reinforcing and supporting mine workings.

Scope of application:

The program is aimed at developing a rational technology for conducting mining operations based on the impact on the technogenic condition of host rock masses for mining companies in Kazakhstan, including JSC “Qarmet,” LLP “Kazakhmys,” Kazcink, ERG, and others. It also targets mining enterprises in the Central Asian region, Russia, and Ukraine. The approach focuses on controlled influence on the technogenic state and deformation processes occurring in the vicinity of capital, preparatory, and cleaning mine workings, passed through unstable host rocks. This is achieved by modifying the mechanical and strength properties of the surrounding rock mass through the installation of artificial structural elements and reinforcing solutions, depending on mining and geological conditions. This method improves the stability of complexly structured rock masses.

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