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DESTRUCTION OF ROCKS BY NON-EXPLOSIVE DESTROYING MIXTURES IN UNDERGROUND MINING

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Purpose. Study of hydration kinetics of non-explosive destructive mixtures and dynamics of pressure increase of their expansion.

Methodology. The first group of experiments was performed on an autodyne NMR spectrometer. Differential method of spectrum registration is used. The second group of experiments was performed in the laboratory on a triaxial compression unit.

Findings. It has been established the regularities of phase change of water in the solution of non-explosive destructive mixtures in the process of hydration that formed by the NMR spectrum of hydrogen and determined the effect of chemical additives on this process. Studies have established the relationship hydration step non-explosive destructive mixtures phase state solution and self-expansion, respectively, with the hardening system. It has been established that the hydration and hardening of self-expansion occurs differently in samples non-explosive destructive mixtures free state and restricting the volumetric changes.

The laboratory tests carried out have established the dynamics of growth pressure and volume of the non-explosive destructive mixtures from the moment of preparation before the end of recrystallization. Were identified features of non-explosive destructive mixtures in different stiffness cavity wall into which it is placed in different directions. The time of the beginning and the flow of the most active growth stage of self-expansion pressure, which is 2,5-2,7 hours. Maximum pressure of self-expansion in a set of zero strain was 52,5 MPa. The results of experimental and theoretical studies, taking into account sufficient accuracy for practical applications, can be used to determine parameters of the quasi-static rocks breaking by non-explosive compound during stratal mining.

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Key words: non-explosive destroying mixture, expansion, hydration, stress, strain

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ADVANCED TECHNOLOGY FOR ROCK DISINTEGRATION USING PLASMA ENERGY

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Purpose. Presentation of efficient approach to hard rocks disintegration using a low-temperature plasma jet.

Methodology. The study of plasma technology was carried out by real field experiments and laboratory research.

Findings. Specialists of the Institute of Geotechnical Mechanics of the NAS of Ukraine developed the technology of well reaming by the thermal method using a low-temperature plasma (3000-3500 $^{\circ}$C temp of jet). The electric arc plasma generator with gas-vortex stabilization of the direct-current arc of power 150-200 kW was developed as a working tool of the new-generation mining machine. The technology was successfully tested in the real ore-mines of Kryvyi Rih (Ukraine) ore bass.

The studies of the IGTM of the NAS of Ukraine found the basic requirements for the abovementioned technology, which provide high efficiency of this method. The mechanism of the process of thermal brittle fracture of the hard ferruginous quartzites and associated rocks of high hardness and abrasiveness has been studied in ore fields of the mines. It is proved that the thermal (plasma) method is feasible during destruction of hard rocks and associated rocks with the hardness of f =16-18, 20 and more according to Prof. M.M. Protodiakonov scale of hardness at the varying metasomatism. The theoretical fundamentals of rock disintegration process under plasma impact were proposed.

The successful results of technology application make it a promising on future growing worldwide.

Key words: plasma technology, hard rock disintegration, well reaming

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