

**Composition of Explosive Substances, Explosion Excitation Method**

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**Annotation:** An analysis of current trends in the development of mining shows that the predominant method of separating rock from the massif in the extraction of minerals is blasting. The method of explosive destruction is also widely used in hydraulic engineering, transport and other types of construction. More than 70% of the volume of minerals in mining is extracted with the help of explosion energy, and the volumes of rock mass separated and displaced by explosions amount to millions of cubic meters per year.

**Keywords:** electric blasting, explosives, electric detonator, non-electric initiation systems.

**INTRODUCTION**

Consequently, blasting is the main process, as it establishes the efficiency of all subsequent mining and processing processes. The use of an explosion makes it possible to shorten the design construction time by several times, as well as to reduce the labor intensity and cost of hydraulic structures, transport and other types of construction work many times over. This establishes the scientific interest that is expressed in the questions of the physics of the action of an explosion in rocks, methods of transferring the energy of an explosion to a rock<sup>1</sup>.

One of the main factors determining the quality of rock crushing is the reliability of operation of the initiation means used in a given time interval. It is known that ensuring the timing of the explosion of some charges or parts of the charges leads to an improvement in the quality of crushing. Unfortunately, the means of initiation do not entirely meet the demand for a reliable holding of the value of the delay interval. Due to the scatter of deceleration values, the moments of operation of adjacent stages of deceleration of short-delayed detonators and pyrotechnic relays can partially overlap, as a result of which simultaneous explosions of several adjacent wells and even rows of wells are quite true, which leads to camouflage, lining, worsening the quality of crushing, the increase in the seismic effect of the explosion and such unpleasant consequences as failures of the explosion.

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<sup>1</sup> Unified safety rules for blasting. NPO OBT, M., 2012.

**MATERIALS AND METHODS**

Explosives are generally divided into individual chemical compounds and mechanical compounds. An individual group of the same explosives usually consists of an atom or group of atoms whose molecules are not stable enough to react chemically to form a new, more stable molecule. The molecule of a chemical compound combines with the combustible elements of oxygen atoms by means of a nitrogen atom to form an inert compound with respect to carbon, oxygen, and hydrogen atoms. It explodes when it is sufficiently compressed and its molecules collide.

**RESULTS AND DISCUSSION**

The groups of active atoms separate from the nitrogen atoms and interact with each other to oxidize with the combustible oxygen in the explosive molecule. An individual explosive chemical compound includes the following explosives<sup>2</sup>:

- 1) nitro compound TNT (trinitrotoluene)  $C_6H_2(NO_2)_3CH_3$ ; dinitro-naphthalene  $C_{10}H_6(NO_2)_2$ ; trinitronaphthalene  $C_{10}H_5(NO_2)_3$ ; trinitrophenol (picric acid)  $C_6H_2(NO_2)_3OH$ ;
- 2) nitromines, in most cases hexogen is used. Gek-sogen  $C_6N_3H_6(NO_2)_3$ ; tetril  $C_6H_2(NO_2)_3NCH_3NO_2$ ; octogen  $C_4N_4H_8(NO_2)_4$ ;
- 3) one or more nitrate groups in nitro ethers  
( $ONO_2$ ) preservative: nitroglycerin  $C_3H_5(ONO_2)_3$ ; nitroglycol  $C_2H_4(O-NO_2)_2$ ; dinitroglycol  $C_4H_8(ONO_2)_2$ ; TЭH C( $CH_2ONO_2$ )<sub>4</sub>; colloidal cotton  $C_{24}H_3O_{11}(ONO_2)_9$ ;
- 4) galvanic acid and its salt (galvanic mercury)  $Hg(ONC)_2$ ;
- 5) nitric hydrogen acid and its salt (lead azide)  $PbN_6$ ;
- 6) teneres  $C_6H(NO_2)_3O_2PbH_2O$  (lead trinitroresorinate).

Combustibles and oxidizers in a mechanical explosive mixture,

that is, all explosives used in blasting. Mechanical explosives often contain excess oxygen molecules, such as ammonium nitrate  $NH_4NO_3$ ; potassium nitrate  $KNO_3$ , sodium nitrate  $NaNO_3$  or calcium nitrate  $Ca(NO_3)_2$ , as well as compounds that are completely or partially combustible during the explosion. The mixture of combustible compounds includes explosive chemical compounds (TNT, hexogen, etc.) whose molecules do not have enough oxygen to completely oxidize carbon and hydrogen, and non-explosive combustible compounds (paraffin, wood flour, diesel oil, aluminum). powder, mipor, etc.). Industrial explosives

The main oxidizing ammonium nitrate,  $NH_4NO_3$ , contains 20% excess oxygen, and the ironized JV grade nitrate is 19%, which simultaneously adds them to the combustible elements. TNT, hexogenic dinitronaphthalenes, which consist of explosive nitro compounds in an explosive mixed with ammonium nitrate, are called ammonites.

Ammonia-nitrate explosives containing up to 15% liquid nitroether are included in the group of nitroether explosives due to their special preparation. These are detonates, carbonites and other explosives. Dynamites (62%, etc.) have elasticity and water resistance due to the addition of large amounts of liquid nitroethers and gelatinized nitrocellulose<sup>3</sup>.

<sup>2</sup> Mangush S.K., Krupov G.M. Blasting operations in underground mining. M., LGI, 2010.

<sup>3</sup> Grabchak A.G., Brylov A.S. Carrying out mining exploration work and the basis for the development of mineral deposits. "Nedra", M., 2018.

Inert additives such as sodium chloride and potassium chloride are added to all explosives to give them preservatives.

All explosives are conventionally divided into primary (explosive, arousal) and secondary (brisant) according to the method of arousal. The primary explosive is very sensitive and can explode with a small charge or a small mechanical or thermal impulse. Explosives include mercury, lead, and teneres. Secondary explosives are almost insensitive to heat and mechanical impact, and such explosives require an initial pulse of charge to ignite a small explosive. Mixtures with industrial explosives, such as nitroether, TNT, dinitronaphthalene, etc., are often used as secondary explosives of the same composition. Hypersensitive secondary explosives: tetryl, hexogen capsule-detonators are used as a secondary charge in the manufacture of explosives, a mixture as an explosive enhancer, the initial impulse to explosives used for.

### **CONCLUSION**

Explosives can be exposed to: explosive (brisant), explosive and flammable (pyrotechnic). These include all secondary individual explosives and their mixtures with industrial explosives. Explosives are powders that have a slower rate of explosion and explode in the form of combustion. They are burned from a heat source. Explosive pyrotechnic devices are used for special purposes (lighting, rocket signaling, etc.). Some of these are used in electric detonators as short-term retarders in blasting operations.

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