Chemical work to move or destroy the environment

ChemicalExplosives Explosivesare concentrated sources of potential energy that can produce an explosion. Thenumber of explosives prepared and known at the present time isestimated over thousands. Inappearance, they come in a variety of colors and have a variety of forms. Currently, explosives are widely used in military affairs and various sectorsof the economy, they are widely used in the mining industry, in construction, in irrigation and reclamation, in agriculture, in the fight against fires, theyfind application in cutting, stamping, welding, hardening metals and otherfields of technology. In recent times, the incidence of terrorism hasincreased, so to combat them, you also need a thorough knowledge of explosives, their operation principle and basic characteristics.

They arechemical compounds or mixtures of them, inclined under the influence ofexternal action to a very rapid chemical transformation with the release of alarge amount of energy and a large volume of gases with a high temperature. Compressed gaseous products, instantly expanding, are capable of producingmechanical work to move or destroy the environment and form shock waves in theenvironment. There are two types of chemical explosive: detonating anddeflagrating explosives. Deflagratingexplosives is also exothermic reaction, but it releases energy fast and atrelatively low pressure thus it is defined as low explosives. Deflagrationsrange from flames to small-scale explosions. It accelerates through thesubstance at subsonic speed, creating a shock wave. For example, gunfire, fireworks, black and smoking powders, even ordinary flame from a candle can beconsidered as a deflagration. However, under a certain condition, such as usinga large quantity of substance or sudden short-duration explosive, thedeflagration

can be caused to detonate, because of a massive amount of energyreleases during a short time.

Detonatingexplosives releases energy very quickly, meaning it is high explosive. Thechemical transformation of an explosive, is accompanied by the release ofenergy and the propagation of the exothermic reaction through the substance atsupersonic speed (6-7thousand meters per second). The chemical reaction is excited by anintense shock wave forming the leading edge of the detonation wave. Thepressure in the front of the shock wave is tens of thousands of megapascals(hundreds of thousands of atmospheres), which explains the tremendousdestructive effect of such processes. The energy released in the chemicalreaction zone continuously maintains high pressure in the shock wave. Detonation occurs in many compounds and mixtures.

For example, tetranitromethaneC(NO2)4, is a heavy colourless liquid with a sharp smell, that is not explosivewhen it is pure. However, mixing it with organic compounds can cause adetonated explosion. Thus, during the lecture in one of the German universitiesin 1919 many students were killed during demonstration of burning a mixture oftetranitromethane and toluene. It turned out that the lab technician, whenpreparing the mixture, mixed up the mass and volume fractions of the componentsand at the reagent densities of 1. 64 and 0. 87 g / cm3, this caused an almosttwofold change in the composition of the mixture, which led to the tragedy. Another example of thisexplosion is characteristic of TNT, hexogen, ammonite, etc.

Detonationexplosive split into primary and secondary high explosives. mercury fulminate, Primary high explosives are easily exploding under the action of asimple initial impulse (impact, friction, a beam of fire, sparks) with therelease of sufficient energy to ignite or detonate blasting explosives(secondary explosives). The primary explosives used for ignition, as a rule, have a high burning rate; a characteristic feature of primary explosives usedto excite detonation that lead to an easy transition of combustion into anexplosion in those conditions (atm pressure, unstable shell or its absence, small charges). It is can also exist as individual compounds or mixtures. Itusually contains a metal atom in the molecule that acts as a catalyst forcombustion, or a group of atoms, in the decomposition of which a large amountof heat is released. For example: mercury fulminate, lead(II) azide Pb(N3)2, cyanuric triazide C3N12, lead styphnate, tetrazene andDDNPSecondaryhigh explosive is usually initiated by primary high explosives. It is relativelyinsensitive to a simple implulses (shock, heat, friction etc) however it isstill classified as a high explosive because it is booster sensitive.

The majorexample of secondary explosives is nitroglycerin as most important component ofexplosives material. Another examples are dynamite, ammonium nitrate (NH3NO2), ANFO (Ammonium Nitrate andFuel Oil), pentolite, booster etc. Historically, chemical explosives started at the 7th century, China was firstwhich invented gunpowder and black powder.

This invention over the pastcenturies has claimed millions of human lives. However, gunpowder was inventedfor other purpose, a fireworks. The

composition of the Chinese powder allowedit to burn, but not to explode. In Europe, gunpowder known since the 13thcentury. From the 14th century.

gunpowder was used as a propellant in afirearm. In the 17th century gunpowder was used for blasting operations inmining, as well as for equipping artillery grenades (explosive nuclei). In 1884the French engineer P. Vielle proposed smoke-free gunpowder. The invention of gunpowder had a huge impact on world history. With the help of firearms, seas and continents were conquered, civilizationswere destroyed and whole nations were destroyed or con quered. However, there were positive moments in the discovery of gunpowder.

Hunting for wildanimals has eased. In 1627 in the territory of modern Slovakia, gunpowder wasfirst used in mining; for the destruction of rock in the mine. The methods ofcasting metals for guns began to be improved, new strong alloys were inventedand tested.

New methods for obtaining gunpowder were also developed and firstof all, ammonium nitrate. In1847, nitroglycerin was synthesized for the first time, but this explosive wastoo unstable and dangerous for production and storage. A little later thisproblem was partially solved by the famous Alfred Nobel, who suggested mixingnitroglycerin with clay, well known this days as a dynamite.

This is a powerfulexplosive, but it is also highly sensitive. During the First World War, dynamite was attempted to equip shells, but this idea was quickly abandoned. Dynamite has used for a long time during mining, but it

does produce in ourdays. Instead of dynamite another the most powerful explosive wasproduced in the world, TNT (trinitrotoluene).

TNT, took big popularity in big countriesdue to several properties: safety, security and production technologies. It formsbecause of the chemical reaction of nitric and sulfuric acids with toluene. It meltsat +80 C, so it can form any shape in order pour in container and combine withother explosives. It is chemically very inert, does not react with metals anddoes not react to water in any way. TNT has such lowsensitivity that it does not explode even from the detonators. It does not form anydangerous salts and can bestored in water, land or ammunition hulls for about 60-70 years, without changingthe explosive properties of TNT. Already in 1913, its production in Germanyincreased to 4, 500 tons, and in 1918 reached 49, 500 tons.

The United Kingdomproduced 60, 000 tons of TNT in 1918. In total, during the years of the FirstWorld War, 2. 5 million tons of TNT were consumed, while the consumption ofother explosives did not exceed several tens of thousands of tons.

The UnitedStates in 1945 produced more than 1 million tons of TNT. Moreover, other powerful explosives wereproduced such as RDX, EDNA and PETN that are mixtures of TNT with othercompounds. However, no other explosive in the world wasproduced as much as TNT. .