

Lead azide is practically insoluble in water (0.023 g/100 g of water at 18 ° C, 0.09 g per 100 g of water at 70 ° C, is poorly soluble in aqueous solution of lead acetate, ammonium acetate and sodium good - ethanolamine (146g azide in 100g ethanolamine). Boiling water decomposes to gradual release of hydrazoic acid. In the presence of moisture and CO_2 is decomposed on the surface to form the carbonate and basic lead azide. decomposes on exposure to light and nitrogen lead-in (on the surface) under intense irradiation freshly prepared lead azide may decompose explosively. If dry, chemically stable and does not react with metals. During storage lead azide should not come into contact with copper and its alloys, as in the presence of moisture forms a mixture of copper azides with unpredictable properties. Toxic. Density 4.71 g/cm³ (bulk ca. 1.2 g/cm³) is tight. - 4.93 g/cm³.

Susceptibility to heat and external influences:

Enough heat-resistant, begins to decompose at 245-250 ° C, flash point of pure a-AS. - Approx. 330 ° C (AS dextrin flashpoint 275 ° C). Sensitivity to impact lead azide moistened slightly smaller than dry, it may be humidified to 30% with virtually no loss of explosive properties. Less sensitive to impact than mercury fulminate (3cm to load 2kg, mercury fulminate 2cm), sensitivity to shock and Table. 16. It is more sensitive to friction than mercury fulminate (dextrin is less sensitive). When you try rubbing in a porcelain mortar - detonates. Comparative sensitivity to the impact of different types of lead azide (2 kg load): dextrin 4-6 inches, 2 inches service, colloidal 3.2-inch, 4-polyvinyl 5dyuyma. Insufficiently sensitive to the line of fire and spark due to the presence of the film base salts of lead, resulting from the impact of the wet storage of carbon dioxide. In freshly prepared chemically pure azide susceptibility to fire is very high. Very dangerous to handle because of the high friction sensitivity (AS freshly prepared more sensitive to friction than technical), sensitivity to fur. influences depends largely on the size of crystals and crystallization process. With the size of the crystals for more than 0.5 mm is extremely explosive. During the synthesis possible explosive decomposition of the step of preparing a saturated solution, crystallization and drying. There have been cases of spontaneous explosions at oversleeping. It is believed that lead azide, lead acetate derived from more dangerous to handle, than those obtained from the nitrate.

Initiating ability:

We lead azide ability to detonate explosives in blasting several times higher than that of mercury fulminate because of the narrow predetonator site. Minimum initiation charge of pure lead azide in the detonator cap pressing in with a cup of tetryl - 0.025g, RDX - 0.02 g of TNT - 0.09g.

Initiating ability by RDX for dec. varieties of lead azide: dextrin-0.09g, 0.025g-English service, polyvinyl-0.03g. Not affected perepressovke.

Energy characteristics:

The heat of the explosion 1.54 MJ / kg. Heat of formation of 112 kcal / mol., Detonation velocity: 4630 m / s at 3.0 g/cm³, 5300 m / s at 4.1 g/cm³. The volume of the explosion products 308 l / kg. Fugacity 110 ml. Brisance on a sand sample 13.8-15g of sand (TNT 43-48g). The pressure on the front of the detonation wave 15.8 GPa at 3.7 g/cm³.

Application:

In blasting caps molded under pressure 600-700kg/sm². First lead azide was obtained by Curtius (Curtius) in 1891 by pouring a solution of lead acetate to the solution of sodium or ammonium azide. In 1907 and 1908 were taken patents on the use of lead azide in the detonator cap. However, up to 1920, practical application of lead azide is not found due to the high sensitivity and the risk of treatment with pure crystalline product. It is only since the late 20s - early 30s of the 20th century, when they were the methods for deposition using organic colloids, the mass industrial production of lead azide, a relatively safe and suitable equipment for detonators. In the U.S., dextrin production of lead azide began in 1931. During the 2 nd World War, began to displace lead azide, mercury

fulminate in the detonator cap, and the end of the 20th century almost completely replaced its obsolete.

Lead azide is used in fire, electric shock and the detonator cap with additives usually THPC, which increases susceptibility to flame tetrazenom, increased susceptibility to impact and pinhole. Lead azide is used in the aluminum or more preferably in steel casings, at least - in the lacquered and tinned copper. Found that to obtain a stable detonation velocity of dry dextrin lead azide charge requires a minimum length of 2.5mm and a considerably longer charge of moistened AS Therefore, in the small-sized products dextrin lead azide does not apply. In England, sometimes used the so-called "British business" lead azide - crystals surrounded by a core of lead carbonate. It contains approx. 98% **Pb (N 3) 2**, and differs from the best thermal and dextrin init. capacity. However, it is more dangerous for certain operations.

Method of Preparation:

Lead azide prepared decanting dilute sodium azide and lead nitrate (rarely lead acetate was used) with stirring in the presence of water-soluble polymers such as dextrin. The use of dextrin produces particles of controlled size 0.1mm with good flowability, rounded shape and reduced susceptibility to abrasion. However, such an AS has high water absorbency and a few of initiative. In some methods, after the formation of dextrin particles of lead azide to lower the sensitivity and water absorption in a solution of calcium stearate is added in a quantity of 0.25%.

It is believed that the use of sodium acetate (nitrate) and sodium azide lead concentration higher than 10% there is a risk of explosion by spontaneous crystallization. In the crystallization of lead azide without stirring after a while is always a blast. Initially it was assumed that the explosion is due to the formation of crystals? - Shapes are detonated by internal stress, but a more careful studies have shown that? - Form can be obtained in pure form, and its sensitivity is similar to a-form.

In the 70's and 80's it was confirmed that the cause of the explosion are electrical in nature due to the redistribution of electric charge in the layers of the solution. The mixing of water-soluble polymers and additive does not allow localized electrical charges and thereby prevent spontaneous explosion. Also, the deposition of lead azide instead dextrin use 0.4-0.5% solution of gelatin supplemented with a small count salt Rochel (cultivar GAM) after the formation of rounded agglomerates lead azide was added to a solution of 0.1% suspension of molybdenum sulfide or less zinc stearate (aluminum) which is adsorbed on the types of the crystal and serves as a "solid" lubricant. Such different lead azide reduced sensitivity to friction. Used as surface treatment of the particles of lead azide solution styphnate magnesium nitrate and lead, which leads to formation of a film of lead styphnate and significant improvement of the susceptibility to the beam of the flame.

For military caps instead dextrin and gelatin used additive Na-carboxymethylcellulose (grade RD1333 and RD1343) or polyvinyl alcohol (grade PVA, used to precipitate 0.3% PVA solution of lead nitrate). The final product contains a larger number of lead azide (ca. 96% PVA azide and 98% sodium carboxymethyl cellulose) than the precipitation method with dextrin (about 92%) and therefore has a greater capacity and initiating much less hygroscopicity.

With the rapid draining of p-ditch without the addition of polymers formed by the so-called colloidal lead azide, the initiator having a maximum capacity, but poor flowability and poor processability, respectively, it is sometimes used in EB as a mixture with ethyl acetate solution of nitrocellulose.

1) Preparation of a prom-minute dextrin lead azide:

By 7.5-9% aqueous p-py lead nitrate was added a small amount of alkali to achieve pH = 7 (rr lead nitrate has a strongly acidic reaction) was added dextrin, with the expectation that its content in the mixture was 0.2%. The mixture was heated to 60 ° C and poured with the stirrer for 1 hour, heated 3% solution of sodium azide. Lead nitrate is usually taken with a slight (10%) to an excess of sodium azide. The mixture was cooled and the contents poured onto the filter. The product was washed with water and dried.

2) Preparation of dextrin lead azide in laboratory:

Dissolve 2.33g of sodium azide and 0.058g of sodium hydroxide in 70ml of distilled water in a beaker number 1. Dissolve 6.9g of lead nitrate and 0.35g of dextrin in water 90ml beaker number 2 and 1-2kapli 10% solution of alkali to raise the pH to 5. Contents of the beaker number 2 is heated in a water bath to 60-65 ° C. and stirred vigorously plastic stick without touching the walls of the glass. Dropwise over 10 min add the contents of a glass of number 1. Beaker number 2 is removed from the water bath and stirring continued give cool to room temperature (within about an hour). Then poured into a beaker of cold water and filtered and the filter cake was washed with water and dried. Yield: about 5g.

3) Preparation of lead azide dextrin Laboratories (simple method):

14-15g of lead nitrate was dissolved in 100 ml. distilled water was added 0.4-0.5g dextrin and stirred until dissolved. Then slowly with gentle but rapid stirring poured solution containing 5g of sodium azide and 50 ml of distilled water. When lead azide settles mother liquor was removed, washed with water, lead azide obtained and filtered.

4) Preparation of sodium carboxymethyl cellulose lead azide in the industry (grade RD 1333)

1.2L solution of Na-CMC (Na-CMC 10 g per liter of water) was mixed with 145ml Empilan AQ (100g ethylene derivative of lauric acid per liter of water) and diluted with water to a volume of 15 liters. During the process held at 25 ° C for 60-70 min in a solution are added simultaneously a solution of sodium azide (108g per liter of water) and lead acetate (315g (CH₃COO) 2Pb * 3H₂O per liter) in an amount of 14 liters each for stirring. The product was washed, filtered and dried. Exit 3.3kg of lead azide. The content of lead azide 96.3%.