

ANDREYEV, S. S.

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24

The upper temperature limit for the deflagration of explosives. K. K. Andreev. *Acta Physicochim. U. R. S. S. J.*, 119-20(1945). Explosives which deflagrate at lower temps. burn slowly and quietly with a flame at still somewhat higher temp. and rapidly with a flame at still higher temps. The upper deflagration limits are approx. TNT 380°, picric acid 350°, tetryl 370°, pentaerythritol tetranitrate 300°, trinitroresorcinol 400°, nitroglycerin 350° and blasting gelatin 250°. The intermediate phase is less marked for larger quantities of explosive (more than 0.05 g.). Previous heating just below deflagration temp. causes deflagration when the explosive is plunged into a bath at a temp. above the upper limit. Addn. of alkali or of decompn. products, but not of H₂SO₄, also tends to produce deflagration. The results are explained on the basis of a max. concn. of intermediate products formed at a certain temp. which catalyze deflagration.

F. H. Rathmann

ASB 35A - METALLURGICAL LITERATURE CLASSIFICATION

ANDREEV, K. K. → ANDREYEV, K. K.

RT-1528 (The mechanism of explosive reactions)
ZHURNAL OBNCHIEI KHIMII, 5: 2128-2134, 1935 (Original Russian Source not available
for review)

ANDREYEV, K.K.

CA

24

The action of gas explosion on solid explosives. K. K. Andreyev and V. P. Maslov. *Comp. rend. acad. sci. U. R. S. S. 25, 195-7(1939)* (in English).--Two series of expts. were carried out (one at atm. and lower pressure, and the other at high pressures) to ascertain the action of gas explosions on solid explosives and to prove the hypothesis set forth in (*C. A. 29, 4998*). In the first series a glass tube, 25 mm. in diam. and 1.5 m. long, was filled with a H-O mixt. after evacuation, and a small amt. of explosive (as a solidified drop or a large crystal) was placed on a piece of Fe in the center of the tube. The H-O mixt. was detonated (by firing a 15 mg. charge

of Pb azide placed in a side arm) and the explosion photographed. Picric acid (I), tetryl- (II) and penta-erythritol-tetranitrate (III) were tested. None of these explosives either exploded or burned when the gaseous mixt. had an initial pressure of 1 atm., or when II and III were heated up to 100°. The Pb azide as a "passive" explosive was found to work well for gas pressures of 700, 400 and 210 mm. In the 2nd series, an electrolytic gas mixt. was introduced into an evacuated steel tube (38 mm. bore and 1 m. long) and exploded by Pb azide as before. Expts. were carried out with I, III and blasting gelatin (IV). At atm. pressure IV did not burn or explode; at 5 and 10 atms. it burned without deforming the tube, while at still higher pressures it exploded and the tube was blown to pieces. III (cast) was found not to burn or explode at 6 or 10 atms.; at 15 atms. it ignited, and exploded at 20 atms.; while III (powd.) exploded at 10 and 15 atms. I was found to burn at 20 and 24 atms. and explode at 30 atms. The authors maintain that the results obtained support the deductions made from their calculations and theory.
Frank Goulet

ALU 514 METALLURGICAL LITERATURE CLASSIFICATION

ANDREYEV, K. K.

Liberation of toxic gases in the explosion of industrial explosives. K. K. Andreyev and M. M. Butkalo. *Compt. rend. acad. sci. U. R. S. S.* 25, 394-9, 1959 (in English); *Gornyi Zhur* 1959, No. 2, 44-7. Ammonite No. 2 (20% trotyl and 80% NH₄NO₃) does not have the optimum compn. with respect to (1) amt. of toxic gases liberated and (2) explosive power. When exploded in a closed bomb in the presence of quartz, an increase in the proportion of trotyl in the mixt. resulted in a great decrease in the amt. of oxides of N formed but increase of the amt. of CO present. Addn. of 1% birch wood meal at the expense of the NH₄NO₃ resulted in a reduction of oxides of N but increase in CO present in the explosion products. An increase in fineness of the ingredients of the explosive from sieve No. 10 to No. 49 vastly reduced the amt. of oxides of N formed in the explosion products but had little or no effect on the amt. of CO formed, further increase in fineness had very little effect. Moisture in the ammonite increases the yield of toxic gases, especially when the ammonite is finely divided. Poor mixing of ammonite ingredients increases the yield of toxic gases. (C. Avery)

24

ANDREYEV K.K.

PROCESSES AND PROPERTIES INDEX

Combustion of explosives under increasing pressure
 K. K. Andreev. *Compt. rend. acad. sci. U. R. S. S.* 20, 409-73 (1940) (in German). Secondary explosives burn at atm. pressure at a rate of a few cm. per sec., independent of the diam. of the tube, the rate increasing as d. of loading decreases. When burned under increasing pressure resulting from their gases of combustion, detonation may occur. Tests were made in heavy closed Pt tubes 20 x 4 cm., the column of explosive being ignited by a 2-g igniter. The pressure was controlled by means of disks of Pb or steel of different thicknesses covering a 3-cm. hole in the closing cap. Pb disks 1, 2.5 and 8 mm. thick blew out at pressures of 25, 65 and 210 kg./sq. cm., resp., and the tubes fragmented at 500-700 kg./sq. cm. The effect on the tube served to indicate the type of decomposition, whether simple burning, explosion or detonation.

Gelatinous explosives (grain dynamite, blasting gelatin and gubir dynamite) burned without detonation. Pulverulent explosives detonated when the increase in rate of combustion produced a crit. pressure in the combustion front. Hexogen and Penthrit detonated under the confinement obtained with a 2.5-mm. Pb disk (65 kg./sq. cm.); Tetryl, picric acid and TNT when steel disks were used. Cast picric acid and TNT gave a lesser degree of fragmentation than the cryst. powder. All of the explosives tested gave fewer fragments when pressed to high d. The tendency to detonate was in the same order as the sensitiveness of the explosives to impact. C. O. S.

ASB-31A METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND LETTERS 3RD AND 4TH LETTERS

ANDREY EV, K. S. PROCESSES AND PROPERTIES INDEX 2/1

ca

The nature of initiating explosives. K. K. Andreyev. *Doklady Akad. Nauk S. S. S. R.* 44, 18-20 (1944); *Compt. rend. acad. sci. U. R. S. S. S. R.* 44, 18-19 (1944) (in English). - High explosives may be classified in 2 groups: (1) initiating explosives (IE) characterized by very much faster burning rates at atm. pressure than (2) secondary explosives (SE). The faster burning rate of IE is attributed to greater heat evolution in the solid phase correlated with instability of the explosive at some temperature at which its vapor pressure is small. Thus a SE can be converted into an IE either (a) by altering the mol. so as to make it less stable, e. g., conversion of trinitrobenzene into trinitrochlorobenzene or (b) by lowering the vapor pressure, e. g., conversion of picric acid into its K salt. Examples are cited showing lack of correlation between the nature of an explosive, as an IE or SE, and its value of Q/E, i. e., the ratio of its heat of reaction to heat of activation. J. W. Perry

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

FROM STUBS FROM BOWTIE

GROUPS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

ANDREYEV, K.K.

PROCESSES AND PROPERTIES INDEX

24

The dependence of the burning velocity of smokeless powders on the pressure. K. K. Andreev and A. P. Bakoev (Mendeleev Inst. of Chem. Tech.). *Compt. rend. acad. sci. U.R.S.S.* 48, 507-70(1945).—Expts. were made in a thick-walled steel bomb (vol. 1.3 l.) with nitroglycerin smokeless powder for rockets, in the form of solid cylinders 5 mm. X 100 mm., wrapped in asbestos and tightly fitted into a glass tube. For pressures from 2 to 20 kg./sq. cm. the law of burning, $v = A + Bp$, previously established (C.A. 37, 1872^a) for pressures up to 2 kg./sq. cm. was confirmed. C. G. Storm

ASB-51A METALLURGICAL LITERATURE CLASSIFICATION

FROM DIVISION

RECORDS AND INDEX

RECORDS AND INDEX

RECORDS AND INDEX

АНДРЕЕВ, К. К.

PROCESSES AND PROPERTIES INDEX

Burning velocity of a Bickford fuse as related to pressure. K. K. Andreev (Mendeleev Inst. of Chem. Tech., Moscow). *Comp. rend. acad. sci. U.S.S.R.* 49, 427-9 (1943). (C. I. 35, 0457). A study is made of the character and velocity of the burning process of Bickford fuses at various pressures from the min., below which the process stops, to 30 kg./sq. cm. At 1 atm. expts. were run in parallel in a bomb and outside it. The absence of a detectable difference in velocity indicated that the fuse does not heat up while burning in the bomb. The expts. at pressures up to 2.5 kg./sq. cm. were carried out with 2 types of fuses designated by A. as black and white; at higher pressures only the white type was studied. The dependence of the burning velocity upon the pressure is expressed by $V = Bp^v$, where for a black fuse $B = 52.8$ and $v = 0.475$ where V is in cm./min. and p lies between 0.17 and 2.4 kg./sq. cm. (at smaller pressures, 0.016 and 0.102 kg./sq. cm., the fuse did not burn). For the white fuse $B = 50.9$ and $v = 0.528$ when p does not exceed 2

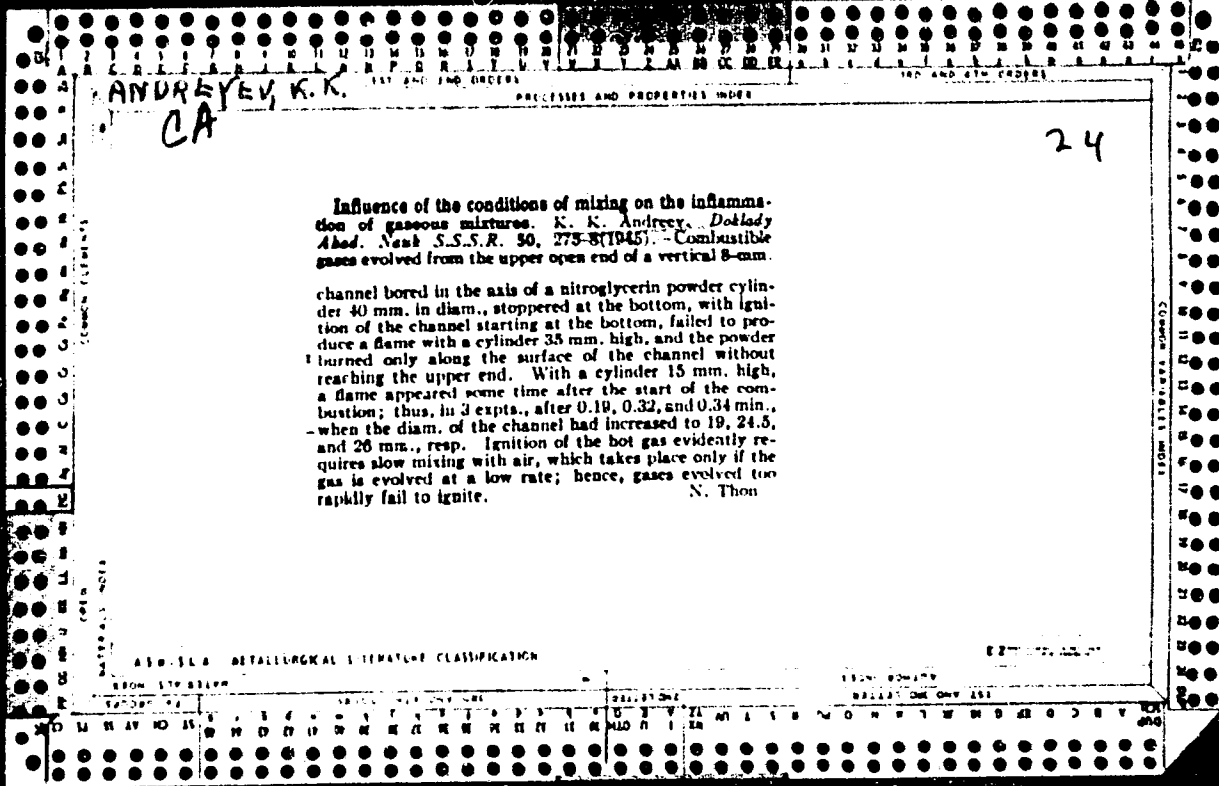
kg./sq. cm., and $B = 72.6$ and $v = 0.238$ when p lies between 4 and 30 kg./sq. cm. Compared to other substances studied by A. (C. I. 37, 1872), the burning velocity of gun powder is least dependent upon the pressure. The burning velocity of gunpowder increases by only 14% upon raising the pressure from 10 to 30 kg./sq. cm. In practice the fuse is burned in a tapering, sometimes very thick, so that the combustion gases do not have free access to the atm. As a result an appreciable pressure may develop in the narrow canal left by the burned out core owing to friction of the gases on its walls as they flow through, especially in the case of deep boreholes and also in the case of clogging of the canal by solid combustion products. The acceleration of the burning process in the borehole as a result of a possible increase in pressure will be relatively small; gunpowder is the most suitable substance for charging a slowly burning fuse. Under pressures which are met with in underwater blasting the possibility of an acceleration in the burning process cannot be neglected; it is necessary to increase the length of the fuse correspondingly. A. did not detect the flashlike acceleration of the burning process which Snelling and Cope observed beginning with pressures as low as 4 atm. (C. I. 6, 031).

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Louis P. Marchi

ABB-51A METALLURGICAL LITERATURE CLASSIFICATION

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24

PROCESSES AND PROPERTIES INDEX

Flash and combustion of nitroglycerin K. K. Andreev.

Doklady Akad. Nauk S.S.S.R. 30, 277-80(1945).—Landau's theoretical formula (C.A. 30, 2023) according to which stable combustion of a liquid explosive will take place only at (mass) velocities of combustion $v_m < (4\sigma g \rho)^{1/2}$ (σ = surface tension at the boiling temp., g and ρ = d. of the liquid and of the gaseous products, resp.) was tested in the case of nitroglycerin. Variation of the σ with the temp. is linear, e.g., at 20, 60.2, 120.2°, σ = 62.4, 46.9, 38.0 dyne/cm.; hence, by extrapolation, at 245°, σ = 29.0. With $\rho = 1.72 \times 10^{-3}$ g./cc., the calcd. $v_m = 0.247$ g./sq. cm./sec. This can be tested in 3 indirect ways. Under 200 mm. Hg, gelatinized nitroglycerin (99:1) burns at the linear rate $\eta = 2.5$, nongelatinized at 3.0 cm./min.; if this ratio is preserved under 760 mm., it gives for the liquid $\eta = 8.58$. If one assumes linear change of η with the pressure, one finds, under 760 mm., $\eta = 8.04$. Extrapolation to zero content of the gelatinizer (from expts. with 1-2% colloidal cotton), one finds $\eta = 8.53$. The mean $\eta = 8.4$ cm./min. corresponds to $v_m = 0.224$ g./sq. cm./sec., in fair agreement with the theory. The velocity of combustion of nitroglycerin is such that stable burning of the nongelatinized liquid under atm. pressure is impossible. It can, however, proceed under lower pressures; thus, under 200 mm. Hg, the expl. $v_m = 0.080$ g./sq. cm./sec. is substantially below the limiting $v_m = 0.134$ calcd. by Landau's formula. Gelatinization facilitates stable burning even under atm. pressure, mainly because of the increased viscosity. At higher temps., e.g. under conditions of flash-point detns. (about 200°), the velocity of combustion being greater and the viscosity smaller, slow burning becomes even less stable than at room temp., and detonation will ensue. Thus, gelatinized nitroglycerin 93:7 detonates on self-ignition; while the 70:30 gelatin does not. N. Thon

METALLURGICAL LITERATURE CLASSIFICATION

FROM SOURCE

АНДРЕЕВ, К. К.

24

Combustion of methyl nitrate. K. K. Andreev and M. M. Purkain. *Doklady Akad. Nauk S.S.S.R.* 50, 281-4 (1945). Landau's inequality (cf. preceding abstr.) was further tested in the case of $MeNO_2$, convenient because of its low boiling temp. (60.5°). At room temp., v_m (in g./sq. cm./sec.) is a linear function of the pressure p (in kg./sq. cm.), $v_m = 0.010 + 0.131 p$, up to 1.5 atm.; from 1.75 atm. up, the surface of the liquid becomes unstable and combustion becomes pulsating until, at still higher pressure, detonation occurs. In terms of temp. t , slow combustion is stable between 0 and 51°, with $v_m = 1/(0.28 - 0.0026 t)$, detonation occurring (without visible pulsation) at 60°. Thus, $MeNO_2$ behaves like nitroglycerol (A., C.I. 40, 8940³) with the only difference that with the latter, uniform burning is perturbed only at $p = 20$ kg./sq. cm., and that, with rising temp., there is no transition from combustion to detonation under atm. pressure. Landau's limiting v_m was calc. with $\alpha = 28.6$ dyne/cm. at 66.5° (by extrapolation of detna. at 60°), with $\lambda = 1.15$ and $\rho = 1.02 \times 10^{-3}$ g./cc. under 1 kg./sq. cm., to $v_m = 0.241$ g./sq. cm./sec.; the exptl. v_m being 0.139, it is clear that slow combustion should be stable under atm. pressure. At 52°, the exptl. $v_m = 0.170$, and

combustion is still stable. At detonation, at 60°, $v_m = 0.195$; the agreement with the calc. limiting v_m is not perfect, but is acceptable in view of the uncertainties involved in the expt. Under $p = 1.75$, at 12°, combustion, in one expt., was stable with $v_m = 0.264$; in another it was pulsating, with $v_m = 0.462$. Consequently, the limiting v_m lies between these 2 values, in agreement with the calc. $v_m = 0.320$. In the case of nitroglycerol, at the boiling temp. (199°), $\alpha = 23.4$, $\lambda = 1.5$, $\rho = 1.57 \times 10^{-3}$, and $v_m = 0.202$, the actual v_m is, at room temp., 0.043, and at 181°, 0.063; consequently, in this case, no detonation can be brought about under atm. pressure by mere increase of the temp. Under higher p , deviation from linearity begins under 17.3 kg./sq. cm., pulsation under 19.3; under these p , the calc. $v_m = 0.847$ and 0.875, resp., as against the actually observed $v_m = 0.793$ and 0.903 g./sq. cm./sec. N. Thon

ASB 354 - METALLURGICAL LITERATURE CLASSIFICATION

12-11-1945

ANDREYEV, K.K. (111 AND 112.001010) PROCESSES AND PROPERTIES METALS (110 AND 111.001010)

24

The mechanism of the pulsating combustion of explosive systems. K. K. Andreev. *J. Phys. Chem. (U.S.S.R.)* 20, 3058 (1946).--Explosions progress in a bed of explosive only if the thermal cond. k is not too great and not too small. When k is too great, the heat is conducted away so rapidly that the temp. drops below the ignition temp. T ; and when k is too small, the hot layer is thin and burns out before the next layer reaches T . Pulsating combustion at low temp. has probably the following mechanism. The first explosion does not progress because k is too great or too small, and the temp. drops below T . But the decompu. of the explosive substance continues also at this temp., and if the decompu. products have an ignition temp. below T , they can explode some time after the first explosion stopped. This process can be repeated again and again. Under some geometrical conditions pulsating combustion takes place also in an interval of pressures. Its mechanism is discussed.

J. J. Bikerman

ASB-56A METALLURGICAL LITERATURE CLASSIFICATION

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CHANDREYEV, K. V.

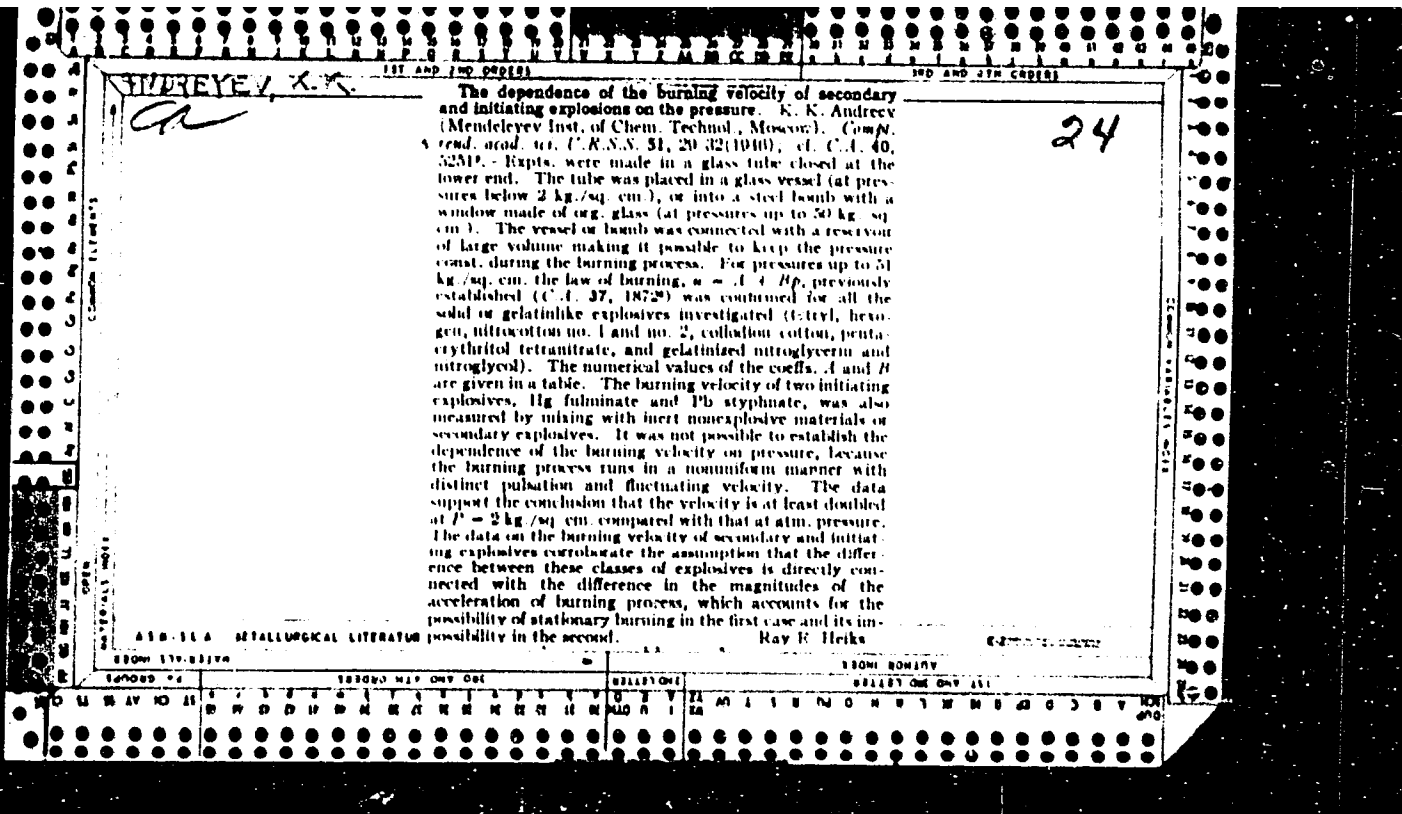
PROCESSED AND PROPERTIES INDEX

24

Combustion of explosives at low pressures. K. K. Andreyev (Mendeleev Chem.-Technol. Inst., Moscow). *J. Phys. Chem. (U.S.S.R.)* 20, 467-92(1946).—Liquid, jelly, solid, or powd. explosives were filled into glass tubes about 6 cm. long and closed at the bottom end. When the explosives were ignited at the top of the tube the flame moved downward at a const. rate for some explosives. In addn. to this flame another remained at the tube orifice for nitroglycol (I) and nitroglycerin jelly (glycerol nitrate 97, collodion 3%) (II). No detonation was observed with I, II, trityl (III), picric acid, tetryl (IV), hexogen (V), and pyroxylin (VI). If the tube broke, the crack was a regular spiral for I and II, whereas black powder (VII) caused straight longitudinal cracks. The mass velocity, v , of the flame was 2.80 g./sq. cm. min. for I in a tube with diam. $D = 3.9$ mm., 9.4 for powd. VI at $D = 5.8$, 13.0 for $\text{Ca}(\text{N}_2)$, at $D = 8$, 1.08 for cast III at $D = 27.5$, and 96 for VII at $D = 2$ to 8 mm. In brass tubes the downward movement of the flame is accelerated (blasting gelatin and gelatin dynamite were tested). The value of D little affects the v of I and III, but v of IV is greater the smaller D is. The flame does not progress when D is too small. The min. value of D at which combustion is still possible depends on the explosive, its packing density, crystal size, and on the thickness of the tube wall. D_{min} was, e.g., for cast IV 5.7 mm., cast III 32, V 6, I less than 2, II less than 8.4, VI 5.5, VII 1. V in gypsum tubes burned steadily only when the wall thickness was less than about 5 mm. The existence of a D_{min} probably is due to heat removal by the tube walls. Often

D_{min} is smaller the higher v is, because a high v means more heat evolved per sec., but the heat cond., K , of the explosive, its boiling, etc. also are important. The importance of the thickness of the wall is another expression of its cooling effect. In the absence of a tube, explosive sticks burn along the surface more rapidly than inside; e.g., for pressed IV the first velocity was 103, and the second 2.8 cm./min. The v of VII wrapped in asbestos was equal in air and in CO_2 . The mass velocity, v , of IV, V, and VI in glass tubes little depends on the bulk density d of the explosive, i.e., the linear velocity u of the flame is almost proportional to d . Powd. VI burns only at d below 0.6. Probably, K of the powder becomes too great when d increases, and the flame loses too much heat. Powders of IV and V burn only at d above 0.7. Probably, the molten explosive penetrates deeper into the powder the smaller the d of the latter. K of the powder embedded in liquid is higher than that of the original powder. VI does not melt. The effect of the crystal size of IV is explained in the same manner. The velocity, u , in glass tubes increases with temp. ($0 - 120^\circ$). The time, t , of combustion of 10 cm. is for I 11.57 - 0.01978 T min., where T is the abs. temp. The extrapolated temp. at which $t = 0$ is 311° for I, 227° for II, 228° for IV, and 365° for V. The explosives I, V, VI, and VII burn only at a pressure, p , above 250 - 400, 600, 400, and 130 mm. Hg, resp. Liquid nitroglycerin burns only at p below 300 mm. Hg. The rate u usually increases linearly with p ; pressures up to 1600 mm. Hg were tested. This linearity contradicts the theory of Zel'dovich (C.A. 57, 4349?). The increase of u with p is great for II and progressively smaller for V, cast IV, and I. The u of VI and that of VII are not linear functions of p .

J. J. Bikerman



117 AND 118 PAPERS
PROCESSES AND PROPERTIES INDEX
140 AND 141M COPIES

CA
ANDREYEV, K. K. 2

Chemical Abstracts
C O U
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Abstracts
M E T A L L U R G I C A L
L I T E R A T U R E

The effect of pressure on the burning of nitroglycol
K. K. Andreev (Mendeleev Inst. for Chem. Tech.
Moscow). *Compt. rend. acad. sci. U.R.S.S.* 51, 123 (1940).—An expl. study of the effect of external pressure on the burning velocity of nitroglycol was made. At high pressures (above 10 kg./sq. cm.) the velocity does not increase at the simple linear rate noted in the low-pressure range. J. K. Taylor

ABSTRACTS
METALLURGICAL LITERATURE CLASSIFICATION

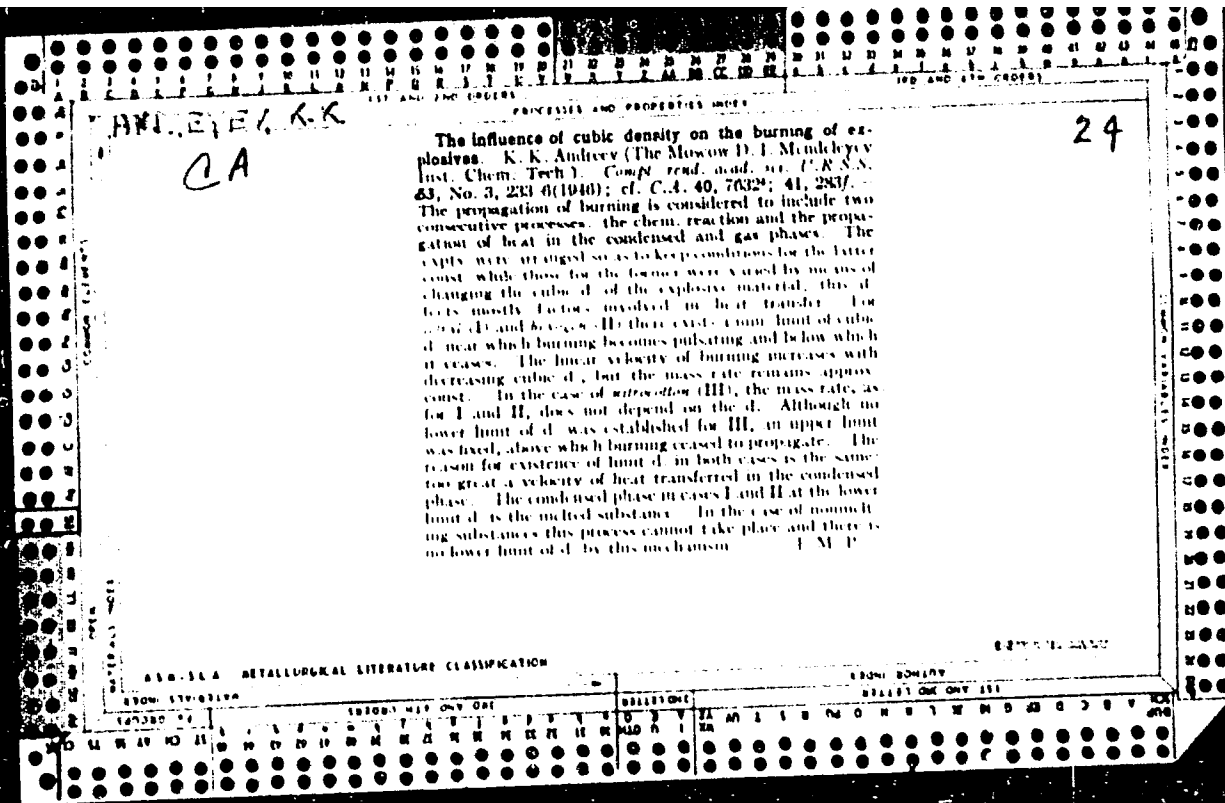
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

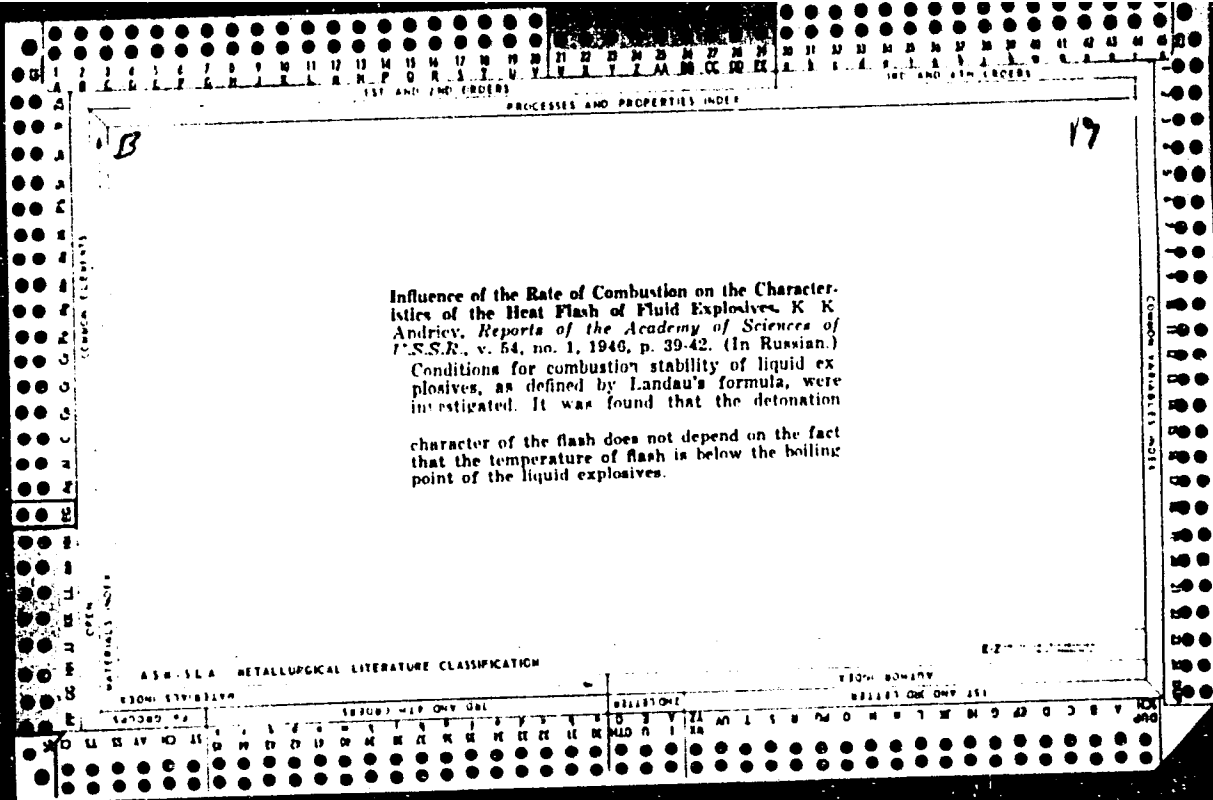
ANDREYEV, K.K. 24

CA

Action of potassium nitrate in the formation of noxious gases during the detonation of industrial explosives. K. K. Andreyev and M. M. Putkalo (D. I. Mendeleev Inst. Chem. Technol., Moscow). *Chem. Technol. USSR*, 1960, No. 11, 1158 (1960). Unpublished expts. by Morin indicated that the addn. of KNO₃ to ammonite explosives decreased the formation of oxides of N and CO (noxious gases). By use of an ammonite (73 NH₄NO₃, 15 KNO₃, 12% trinitrotoluene) which had given the most favorable results, it was shown that the amt. of sand surrounding the charge greatly influenced not only the decompn. of the charge itself but also the formation of noxious gases. Since in actual practice the favorable conditions established by expt. will usually not prevail, the addn. of KNO₃ will not solve the problem of reducing noxious gases. The method of raising the detonation capacity of ammonites by more thorough pulverization and mixing as well as by increasing heat of explosion was practical, as was shown by expts. on an ammonite (18.4 trinitrotoluene, 1 wood meal, 77.0% NH₄NO₃, in quartz sand surrounding the charge). R. Wicks

ASB-55A METALLURGICAL LITERATURE CLASSIFICATION





ANDREYEV, K.K. 24

CA

Determination of inflammability of explosives. K. K. Andreyev and I. D. Kostin (Mendeleev Inst. Chem. Tech., Moscow). *Compt. rend. acad. sci. U.R.S.S.* 54, 241-4 (1940) (in English). The ignition of an explosive of one density by the same or another explosive of another density was studied in a one-cm. vertical glass tube, the igniting substance being placed over the substance being tested. As the density of the igniting explosive was reduced, its tendency to ignite the substance under test was reduced. When the substance under test has a high density, it has a high heat transfer, and the heat input from the igniting substance is insufficient to compensate for the heat transfer into the substance under test. Consequently the burning process comes to a stop. W. N. Baker

ASB-314 METALLURGICAL LITERATURE CLASSIFICATION

ANDREYEV, K.K.

U S S R

Flashing of explosive substances. K. K. Andreev. Zhur. Priklad. Khim. 21, 402-72(1948).--A review with 10 Russian references is supplemented with findings of A. Contrary to Belyaev (cf. C.A. 35, 5317) A. found that flashing characteristics of explosive substances cannot be detd. by the relation between b.p. and flash point: A. explains also the reasons why during rapid heating of some of the explosive substances to high temp., instead of a flash, a flameless decompn. takes place. This is due to the small concn. of the decompn. products at the b.p. The decompn. products are responsible for self-inflammation (I). Vapors of explosives having a much higher temp. of I than the b.p. decomp. without a flash; however, at high temp. I takes place again.

Frank J. Hendel

lw

ANDREYEV, K. K.
ANDREEV, K. K.

37180. ANDRE'V, K. K. i OTKRYTIE A. G. Stoletova, (Yavlenie Fotoeffekta).
V sb: Nauka i Zhizn. M., 1949, s. 159-72

SO: Letopis' Zhurnal'nykh Statey Vol 7, 1949

AMUREYEV, K.K.
CA

24

Mechanism of ignition of methane-air mixtures upon the detonation of explosive materials. K. N. Amureyev and M. A. Rabinovich (Mendeleev Chem.-Tech. Inst., Moscow). *Zhur. Fiz. Khim.* 24, 650-61 (1950). Pb, (Ni)₂, Pb trinitroselenate, Hg fulminate, gunpowder, K picrate, fulminate jelly, and guncotton were exploded in a H₂O mist, and the same materials + TNT were exploded in a CH₄-air mist. If the amt. of explosive is above a crit. point (different for each material), ignition takes place. The crit. limits were not the same for both gas mixes. The ignition was also affected by the type of explosion (normal, with dispersion of the explosive, flash, or detonation). The reason for this difference is in the time delay for the auto-ignition of the 2 mixes. The results are examined in terms of a theory of safety explosives for mining operations. Paul W. Howerton

ANDREYEV, K.K.; GLAZKOVA, A.P.

Theory of anti-firedamp action. Doklady Akad. Nauk S.S.S.R. 86, 801-3 '52.
(CA 47 no.19:10229 '53) (MLRA 5:11)

1. D.I.Mendeleyev Chem.-Technol. Inst., Moscow.

ANDREYEV, K.K., professor.

[Explosion] Vzryv. Moskva, Gos.izd-vo tekhniko-teoret.lit-ry, 1953. 61 p.
(MLRA 6:7)
(Blasting)

Category: USSR

B-9

Abs Jour: Zh-Kh, No 3, 1957, 7557

Author : Andreyev, K. K. and Glazkova, A. P.

Inst : Academy of Sciences USSR

Title : On the Effect of the Decomposition Products and Some Impurities on the Thermal Decomposition of Nitroglycerine

Orig Pub: Dokl AN SSSR, 1955, No 2, 286-289

Abstract: It has been shown by means of a membrane-type glass manometer that the decomposition of nitroglycerine (I) which has been purified of volatile impurities (water, etc.) is not accelerated by the presence of large amounts of decomposition products. When I contains water, a sharp acceleration of the decomposition is observed after a certain induction period (IP). The authors explain this acceleration by the hydrolysis of nitrocellulose, which is cata-

Card : 1/2

-13-

Category: USSR

B-9

Abs Jour: Zh-Kh, No 3, 1957, 7557

lyzed by the acid decomposition products of I, and the subsequent oxidation reactions. The addition of acids to I markedly decreases the IP. Partly decomposed I, after washing with water, reacts at the same rate as fresh I. The water which is formed also catalyzes the decomposition. The removal of the decomposition products by the application of suction does not completely suppress the catalyzing action. The addition of HNO_3 and of glyceryldinitrate to I catalyzes the decomposition; in the latter cases, however, the reaction rate increases only after a considerable IP. The effect of water and acids described above is also observed in the case of nitroglycol and (under certain conditions) in the case of nitrocellulose.

(D.I. Mendeleev Moscow Chem-Technol
Instl).

Card : 2/2

.14.

ANDREYEV, K. K.

✓ Testing the sensitivity to mechanical shocks of explosives, using the ram impact method. K. K. Andreev, N. D. Maurya, and Yu. A. Rusakova. *Doklady Akad. Nauk S.S.S.R.* 105, 544-5 (1955).—The standard method of testing the susceptibility of explosives to shocks is described, and the results are claimed to have highly controversial significance and may at times give erroneous ideas about the explosives safety. Pb azide (99.5% PbN₆), in the form of fine granules and compressed under 5000 kg./sq. cm. pressure, was tested in a standard app. in a slightly modified app. A "phlegmatized" prepn., contg. about 5% paraffin, gave a much larger no. of explosions with the same height of drop (10 and 20 in.) of the standard 25-kg. wt. When the samples were placed between Pb plates, the no. of explosions was very greatly increased, reaching 100% of the tests. An explanation of the erratic test results was suggested by Kholero (*Tруды Kazan. Khim.-Tekhnol. Inst.* 10, 91(1946); 11, 116(1947)), according to whom the mutual relative displacement of the particles causes a local heating which is a necessary preliminary stage in explosions. Poorly flowing materials, like PbN₆, are compressed by impact on the standard app. with little flow, while with the Pb plates the same material will adhere to the plates and be displaced in relation to the rest of it. W. M. Sternberg

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ANDREYEV, Konstantin Konstantinevich, professor, doktor tekhnicheskikh nauk; SHITKO, B.S., professor, doktor tekhnicheskikh nauk, redaktor; LYALIKOV, B.S., polkovnik, redaktor; LEVINSKAYA, N.Z., tekhnicheskiy redaktor.

[Explosions and explosives] Vzryv i vzryvchatye veshchestva. Moskva, Voen.isd-vo Ministerstva obor. soiusa SSR, 1956. 116 p. (MLRA 9:5)
(Explosives)

ANDREYEV, Konstantin Konstantinovich, professor; VERNIDUB, I.I., redaktor
FRIDKIN, A.M., tekhnicheskii redaktor

[Thermal disintegration and combustion of explosives]
Termicheskoe razlozhenie i gorenie vsryvchatykh veshchestv.
Moskva, Gos. energ. izd-vo 1957. 311 p. (MLRA 10:5)
(Explosives)

AUTHORS: Andreyev, K. K., Samsonov, B. S. 20 114-4-37/63

TITLE: Thermal Decomposition of Nitrocellulose in Vacuum (O termicheskom raspade nitrokletchatki v vakuume)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 4, pp. 815-818 (USSR)

ABSTRACT: As is well known the thermal decomposition of nitrocellulose takes place at a constant absolute velocity of separation of the gaseous nitrogen compounds, if carried out in the current of an inert gas. It takes place with a high acceleration, however, if one does not draw off the gaseous decomposition products. The constancy of the absolute velocity means after all a substantial increase in the relative velocity on a considerable period of the decomposition process. It might be assumed that the reason for this increase might be seen in the incomplete drawing-off of the decomposition products. Lebedev's tests proved however, that the absolute velocity of the formation of gas does not only not decrease in the case of an uninterrupted drawing-off of the gases forming in the course of the decomposition, but that it increases several times (up to 8 times). In connection with these results the

Card 1/4

Thermal Decomposition of Nitrocellulose in Vacuum

20-114-4-37/63

decomposition of nitrocellulose (13.35%) was more closely investigated in the vacuum. The diagrams of figure 1 show that the formation velocity of the gases originating at 160°C, which is highest at the initial point, decreases uninterruptedly. This is true for gases condensed in a trap of liquid nitrogen. The formation velocity of gases not caught in the trap, on the contrary, drops continuously according to Lebedev's results. At the beginning it is relatively low, but at the culminating point it rises 7-8 times and approaches the formation velocity of the condensable gases. Culminating point being passed, the formation velocity of the hard condensable gases drops. Its volume amounts to from 1/4 to 1/3 of the total volume of the decomposition products. According to the course of the above graph, the summary velocity of gas formation remains nearly constant for some time, that is until the culminating point in the curve of the hard condensable gases is reached; it then drops rapidly. The same diagram of the course of decomposition is confirmed by the curves showing up the loss in weight. The diagram of the dependence of the velocities of gas formations on temperature enables us to compute the kinetic coefficient of Arrhenius' equation. The dependence of this velocity on time is different for the

Card 2/4

Thermal Decomposition of Nitrocellulose in Vacuum

20 114-4-37/63

condensable and hard condensable gases, in the case of decomposition in the vacuum. This is hard to explain, unless one assumes at least two subsequent reactions. However, one may not consider the formation of the condensable gases as a simple monomolecular reaction, for the summary velocity of gas formation increases considerably. From these facts it may be concluded that such characteristics as the summary velocity or the loss of weight are the result of a number of reactions. For this reason they may not be directly used for the computation of the kinetic parameters of the individual reactions. The above-said is true for tests in the vacuum. Without the vacuum the formation of gas takes place with a considerable acceleration. More gases than in the vacuum are obtained and the weight of the solid residue is less. Most probably the influence of the gaseous decomposition products consists chiefly of the interaction of their components capable of reaction with one another and with the solid matter and leads to the formation of additional gas volumes. At the beginning of the test oxygen slows down the formation of gas, but in the further course of the test it causes a rapid acceleration of decomposition. Vapor alone little accelerates

Card 3/4

Thermal Decomposition of Nitrocellulose in Vacuum

20-114-4-37/63

the process, but together with oxygen there occurs, after an induction period, a sudden fall in pressure and then a rapid acceleration of the formation of gas. Thus the decomposition diagram described in publications is in reality determined by a common effect of water and atmospheric oxygen. The difference between nitrocellulose and nitro-glycerin, whose decomposition is accelerated by water also without oxygen, is apparently, above all, due to the fact that the separated nitrogendioxide at nitrocellulose may be rapidly reduced into monoxide. that no acids form, and that in their absence the hydrolysis progresses slowly. There are 2 figures, 1 table, and 6 references, 2 of which are Soviet.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskii institut im. D. I. Mendeleyeva (Moscow Chemical-Technological Institute imeni D. I. Mendeleev)

PRESENTED: November 17, 1956, by V. N. Kondrat'yev, Member, Academy of Sciences, USSR

SUBMITTED: November 16, 1956.

Card 4/4

AUTHORS: Andreyev, E. K., Gansonov, B. S. SOV/156-58-2-7/46

TITLE: On the Character of the Explosion of Some Explosives and on the Influence of the Pressure on This Process (O kharaktere vsnyeshki nekotorykh vzryvchatykh veshchestv i vliyaniy na nego devleniya)

BIBLIOGRAPHICAL: Nauchnyye doklady vysshey shkoly, Khimiya i khimicheskaya tekhnologiya, 1958, Nr 2, pp. 229-232 (USSR)

ABSTRACT: Starting from the present conceptions concerning the process of combustion and of detonation of explosives, it is assumed that an abrupt increase in pressure is a necessary **require-**ment of the detonation at the ignition of an explosive. The increase in pressure must be enormous in order to form a shock wave, which is not extinguished at once but guarantees a propagation of the detonation wave. One way of bringing about a sudden rise in pressure is the formation of a suspension of particles of the explosive by way of imperfect combustion as is the rule. In case of a sufficient thickness of the layer of suspension, an explosion occurs in it which leads immediately to a sudden rise in pressure. By this the unburnt portion of **charge** of the explosive detonates. The

Card 1/3

JOY 156-58-2-7/48

On the Character of the Explosion of Some Explosives and on the Influence of the Pressure on This Process

pressure under which the combustion proceeds exercises a double influence: a) The rise in pressure favors the appearance of the Landau-effect (Ref 2) and b) it can prevent the formation of a thick layer of suspension. However, a drop suspension of the explosion can be brought about in some way or other by a slow heating from outside. The quantity of the dispersed explosive can be controlled by a modification of the thickness of the heated zone. The authors of the present paper described most simple tests with different kinds of explosives. For this reason a little test tube (radius 4 mm, length 1,5 cm) was filled with varying quantities of nitro-glycerin. A chrome-nickel wire provided for heat and was twisted around the lower part of the glass tube up to a height of 5 cm. A short period of "boiling" entailed an explosion **blowing** the glass tube into pieces. Filled up with **nitro-**glycerin to the mark of 1 mm, the glass tube remained s. l. Then the heating coil was fixed at different parts of the tube. Tests with other explosives proved (nitro-glycerol, diethyl-nitrate, T.N., tetrad. ... weight) that the layer of 5 mm

Part 2/3

156

On the Character of the Explosion of Some Explosives and on the Influence of the Pressure on This Process

...tion neither at a ... nor at ... structures of excess pressure. ... nitroglycerin is ... it exceeds considerably the limit which is necessary for the Louren-effect. The other explosives, mentioned above, are marked by much lower limits. ... this explanation is true, the character of the explosion ... depend on the pressure. However, a greater length of the glass tube results in a higher pressure at the ... The intensity of heating, too, exercises an influence on the character of the phenomenon as well as on the position of the heating coil. ... which are listed.

ASSOCIATED WITH: Moskovskiy Khimiko-tekhnologicheskiy Institut im. D. I. Mendeleeva (USSR Academy of Sciences, Institute of Chemical Technology)
October 17, 1957

Card 3/3

AUTHOR: Andreyev, K. K. SCV/156-58-4-6/49

TITLE: On the Problem Concerning Theoretical Source Material of the Methods for the Determination of the Chemical Stability of Explosives (K voprosu o teoreticheskikh osnovakh metodiki opredeleniya khimicheskoy stoystoi vzryvchatykh veshchestv)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Khimiya i khimicheskaya tekhnologiya, 1958, Nr 4, pp 635-639 (USSR)

ABSTRACT: The chemical transformation of explosives is a complex process. Parallel and chain reactions occur which vary with temperature. The stability of explosives is characterized by the initial velocity of the automatic chemical transformation, the reactions accelerating themselves, and by the influence exerted by the additions during the reactions. The velocity of gas formation of nitro-glycerin at 80° and of tetryl at 40°C in dependence on time during the thermal decomposition. There are two different types of thermal decomposition in explosives. The first type is under the influence of the decomposition products or some impurities, whereby the thermal decomposition is highly accelerated. The second type is characterized by a relatively slow acceleration of the thermal decomposition by the decomposition products and impurities (nitro amine and

Card 1/2

SOV/156-58-4-6/49

On the Problem Concerning Theoretical Source Material of the Methods for
the Determination of the Chemical Stability of Explosives

nitro compounds of the aromatic series). The initial velocity
of transformation is the typical feature of this type of
decomposition.

There are 1 figure and 10 references, 6 of which are Soviet.

ASSOCIATION: Moskovskiy khimiko-tehnologicheskii institut im. D. I. Mende-
leyeva (Moscow Chemo-Technological Institute imeni D. I. Mende-
leyev)

SUBMITTED: April 18, 1958

Card 2/2

ANDREYEV, K.K.

Decomposition of nitroglycerin at elevated temperatures. Zhur.prikl.
khim. 31 no.3:484-493 Mr '58. (MIRA 11:4)

1.Moskovskiy khimiko-tekhnologicheskij institut im. D.I. Mendeleeva.
(Nitroglycerin)

AUTHORS: Andreyev, K. K., Glazkova, A. P., Maurina, N. D., Svetlov, B. S. SOV/76-32-8-5/37

TITLE: The Thermal Decomposition of Nitro Esters (Termicheskiy raspad nitroefirov) I. Investigation of the Kinetics of the Decomposition of Nitroglycerin and Nitroglycol According to the Manometric Method (I Issledovaniye kinetiki raspada nitroglitserina i nitroglikolya manometricheskim metodom)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 8, pp 1726-1738 (USSR)

ABSTRACT: In the introduction the authors mention the investigations already carried out in this field and explain them; the papers by Robertson (Ref 1), Will (Vill) (Ref 2), S. Z. Roginskiy et al. (Ref 4), and A. Yu. Apin, O. M. Tozes and Yu. B. Khariton (Ref 7) are mentioned. As the high temperature-coefficient of the decomposition rate of nitroglycerin does not depend on a high resistance of its molecule but on the heterogeneity of the course of decomposition a further investigation of this thermal decomposition especill under simple conditions turns out to be interesting. A glass manometer with a thin-walled crescent-shaped glass membranc was used for the present experiments. The

Card 1/3

SOV/76-32-B-5/37

The Thermal Decomposition of Nitro Esters. I. Investigation of the Kinetics of the Decomposition of Nitroglycerin and Nitroglycol According to the Manometric Method

investigations in the vapor phase were carried out at 140, 150, and 165° and the maximum limit values of m/v were calculated according to the data by Brandner (Ref 1). It is assumed that in the thermal decomposition of nitroglycerin at least two macroscopic reaction stages exist as far as could be observed; also a reduction of the nitrogen dioxide to the oxide may take place. Thus, the rate of gas formation does not vary with time in strict accordance with an equation of a first order reaction. In the case of nitroglycol a similar result was obtained, with the difference that this process proceeded more quickly in the beginning. Experiments carried out in the liquid phase at small m/v and at temperatures of from 80 to 165° yielded values agreeing with those obtained by Robertson, although the intermediates were not removed. The decomposition in the liquid phase differs from that in the gas phase by the character of the $p = f(\tau)$ curves and the absolute value of the initial rate of gas formation. The effect of the decomposition products on the decomposition was investigated. Those with nitrogen dioxide were carried out by L. Ye. Tsebukhovskaya, and those with water by

Card 2/3

SOV/76-32-8-5/37

The Thermal Decomposition of Nitro Esters. I. Investigation of the Kinetics of the Decomposition of Nitroglycerin and Nitroglycol According to the Manometric Method

G. N. Bespalov, student. Then the author thanks N. M. Emanuel'. There are 10 figures, 2 tables, and 12 references, 6 of which are Soviet.

ASSOCIATION: Khimiko-tekhnologicheskii institut im. D. I. Mendeleeva, Moskva (Institute of Chemical Technology imeni D. I. Mendeleev, Moscow)

SUBMITTED: January 23, 1957

Card 3/3

4(6)

AUTHOR:

Andreyev, K. K.

SOV/156-59-2-5/48

TITLE:

On the Physical Heat Resistance of the Crystals of Several Explosives (O fizicheskoy termostoykosti kristallov nekotorykh vzryvchatykh veshchestv)

PERIODICAL:

Nauchnyye doklady vysshey shkoly. Khimiya i khimicheskaya tekhnologiya, 1959, Nr 2, pp 244-247 (USSR)

ABSTRACT:

In burning explosives the transition from combustion to explosion occurs at different pressures. This process is, however, in no relation to the rate of combustion. Experiments carried out by I. A. Tereshkin, A. P. Glazkova and P. P. Popova showed that in the case of combustion of explosives under high pressure (500-1000 at) the rate of combustion increases in proportion to pressure. These values do, however, not explain the different behavior of the explosives. The present paper is based on the assumption that the tendency towards exploding is promoted by fractures in the crystalline explosive. Warm gases enter the rapidly widening fractures so that combustion surface grows rapidly. In order to in-

Card 1/3

SOV/156-59-2-5/48

On the Physical Heat Resistance of the Crystals of Several Explosives

Investigate these crystals of explosives were slowly cooled down to low temperatures and then thrown into water which had room temperature. The temperature difference at which a splitting up of crystals occurred was determined. Ten, Hexogen, tetryl and trotyl were found to be sensitive already to a difference of $\approx 30^\circ$. Nitroglycerin gunpowder showed no fractures at a jump of temperature of from -190° to $+20^\circ$. Among the phenomena disturbing the combustion in parallel layers (porosity, not uniform process of the reaction, transition to turbulence) the fourth possibility is the splitting up of crystals. Desensitizing of the particles with a tough inert film reduces the tendency towards explosion. There are 3 Soviet references.

PRESENTED BY: Moskovskiy khimiko-tekhnologicheskii institut im. D. I. Mendeleeva
(Moscow Institute of Chemical Technology imeni D. I. Mendeleev)

Card 2/3

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67479

AUTHOR: Andreyev, K.K. (Moscow)

SOV/24.59.4.23/33

TITLE: The Mechanism of the Origin of Detonation in Explosive Bodies

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1959, Nr 4, pp 188-197 (USSR)

ABSTRACT: All explosive bodies ignite when kindled but the subsequent behaviour shows wide differences. Some substances such as smokeless powder simply burn; with others, such as initiators, the burning is more or less rapidly transformed into detonation. Secondary explosives occupy an intermediate position but the burning stability of these materials depends on physical structure as well as on chemical composition. The various ways of exciting detonation (burning under different conditions, by explosion at a distance and by shock) are discussed. One basic factor is the sudden increase in pressure arising from the formation and explosive burning of suspensions of substances in the gaseous explosive products. The methods by which such suspensions can be formed (penetration of gaseous products into porous explosive materials, irregular

Card1/2

67479

SOV/24.59.4.23/33

The Mechanism of the Origin of Detonation in Explosive Bodies

progress of chemical reactions peculiar to solid bodies, the production of turbulence in liquids on burning, disintegration of particles of explosive materials on sudden heating) are considered. There is 1 figure. There are 18 references, 2 of which are French, 2 English and 14 Soviet.

SUBMITTED: July 15, 1957



Card 2/2

ANDREYEV, K. K.

PHASE I BOOK EXPLOITATION

SOV/5150

Andreyev, Konstantin Konstantinovich, and Aleksandr Fedorovich
Belyayev

Teoriya vzryvchatykh veshchestv (Theory of Explosive Materials)
Moscow, Oborongiz, 1950. 595 p. Errata slip inserted. 9,000
copies printed.

Reviewers: K. K. Snitko, Doctor of Technical Sciences, Professor, and
D. S. Avanesov, Candidate of Chemical Sciences, Docent; Ed.:
A. I. Gol'binder, Doctor of Technical Sciences; Ed. of Publishing
House: G. F. Loseva; Tech. Ed.: L. A. Garnukhina; Managing Ed.:
S. D. Krasil'nikov, Engineer.

PURPOSE: This textbook is intended for students in chemical tech-
nology schools of higher education and in military academies. It
may also be used by personnel of plants and scientific research
institutes.

COVERAGE: The textbook covers the theory of explosives, describing
slow thermal conversion, combustion, the detonation of explosives,

Card 1/16

Theory of Explosive Materials

SOV/5150

and the physicochemical properties of explosives essential for
their production. The various applications of explosives are
outlined. The appendixes contain data on the combustion range
of gases and vapors mixed with air and with oxygen; sensitivity
of explosives to shock; oxygen balance of explosives and ingredi-
ents of explosive mixtures; heats of formation of explosives,
initial materials, ingredients of explosive mixtures, and ex-
plosion products; heats of combustion of nitro compounds; equi-
librium constants; change in the internal energy of gases, graph-
ite, and solid ingredients of explosion products; molar volumes
of solid inorganic substances found in explosion products; values
of second virial coefficients of gaseous explosion products at
high temperature; and test methods and apparatus for explosives
according to the State All-Union Standard Specifications. The
authors thank D. S. Avanesov, A. Ya. Apin, A. I. Gol'binder,
L. V. Dubnov, A. A. Zaytsev, A. M. Lomova, K. K. Snitko,
I. V. Tishunin, and N. A. Kholevo. There are 25 references:
21 Soviet and 4 English.

Card 2/16

85958

Combustibility of Protective Explosives

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B016/B054

determined. Table 1 shows the composition of the ammonites investigated which contain no nitro ester. On the other hand, pobedite ПУ-2 (PU-2), БП-1 (VP-1), and БП-3 (VP-3) contains up to 9% of nitro ester mixture. Fig. 1 shows the experimental results. Hence, the authors conclude that the critical diameter of all explosives investigated (except for the waterproof pobedite VP-3) lies between 7 and 13 mm at all densities and at 100-120 atm. This value lies far below the usual measure of blasting cartridges. The critical diameter of pobedites is smaller, but the combustion rate is higher than that of ammonites. The latter also applies to dynamites. The rate of combustion decreases with increasing density (contrary to statements made for other explosives in Ref. 1). The critical diameter, as a rule, also decreases in spite of the decreasing combustion rate. The authors assume here a considerable effect of the exothermic reaction in the condensed phase on the flame propagation. The critical diameter of pobedite VP-3 could not be reliably measured by means of the method used by the authors. The combustibility of VP-3 proved to be much higher than that of VP-1 at 100-120 atm. This is probably due to the catalytic effect of the mineral components of admixtures added to the saltpeter to make it waterproof. This catalytic effect is, however, not

Card 2/3

21015
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D247/DIG

11.2121

AUTHORS: Anshin, K.K., Sheraputina, V.P.

TITLE: The influence of the oxides of nitrogen on the dissociation of nitroglycerine

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 9, 1961.

TEXT: The acid catalytic action of nitrogen dioxide shortens the pre-dissociation period, as do small quantities of water. Although weaker and itself a weak oxidizer, nitric oxide also speeds the decomposition. It was proposed to study the effect of nitric oxide, nitrogen dioxide and water. The experiments were carried out at 80° by the manometric method. Nitroglycerine was twice distilled in a high vacuum and had a fusion temper. of 134.6°. Measured amounts of volume were added to the reaction vessel by cooling with liquid nitrogen. Nitric oxide was formed in a Lange nitrometer from chemically pure potassium nitrate and sulphuric acid, nitrous acid and

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nitrogen dioxide by mixing nitric oxide and oxygen. The gases were dried a ... % nitric oxide delayed the pressure rise but shortened the ... period (14,000 mins. compared to 14,000 mins.) with ... plus slight excess of oxygen ... rate of rise of pressure and the ... as early in the ... The effect of both gases together was greater than the ... of their separate ... Water plus the two gases ... the ... period. Thus, with water: ... mm of nitric oxide and ... mm of nitrogen dioxide ... 200 ... mins. compared with 14,000 mins for pure nitroglycerine and ... mins. for a similar amount of water. During the dissociation of nitroglycerine in the presence of moderate quantities of water there is a long period of constant pressure followed by a quick fall as a result of the hydrolysis of water to nitric ... minimum, the pressure begins to rise. The period of constant pressure is unaffected by nitric oxide; there is no fall and the rise is much quicker.

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The influence of the ...

The presence of nitric oxide has no visible effect on processes taking place during the period of constant pressure; the absence of pressure fall is because the solubility of nitrous acid and nitrogen dioxide is much less than that of nitric acid. The subsequent rapid rise of pressure is because the oxidizing action of the oxides of nitrogen and its lower acids is less than that of nitric acid. Thus on warming nitroglycerine in the presence of water, hydrolysis takes place at first to give nitric acid, the process being accelerated by the products of thermal dissociation. On reaching a specific acid level the reaction speeds up and the water is wholly converted to nitric acid which oxidizes the nitrate or trinitrate to form the oxides of nitrogen and water. The reaction of nitric acid is relatively slow. The oxides of nitrogen, as shown, oxidize quicker than nitric acid and the process speeds up correspondingly. In so far as the oxidation of nitrates is accompanied by the formation of oxides it is self-accelerating. A supplementary factor may be the heat produced during oxidation. Thus, the process can reach very high speeds and may even lead to

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The influence of the ...

explosions at relatively low temperatures (at normal storage temperatures) should the container be too small. Conclusions: 1) Oxides of nitrogen shorten the induction period when nitroglycerine dissociates on heating, nitric oxide acts weakly, nitrogen dioxide more strongly, a mixture of the two is the strongest of all; 2) A triple mixture of water vapor, nitrogen dioxide and nitric oxide is even more effective. 3) During the dissociation of nitroglycerine in the presence of water, nitric oxide prevents the initial fall of pressure, shortens the induction period and speeds up the rate of pressure rise. There are 2 figures and 2 Soviet-bloc references.

SUBMITTED: December 8, 1960

Card 444

89576

S/076/61/035/002/013/015
3107/3220

//5100

AUTHORS:

Andreyev, K. K., Glazkova, A. P., and Tereshkin, I. A.
(Moscow)

TITLE:

The influence of pressure on the burning of liquid explosives

PERIODICAL:

Zhurnal fizicheskoy khimii, v. 35, no. 2, 1961, 426-430

TEXT: The study concerns the combustion of nitroglycol in a glass tube of 3-4 mm diameter at pressures of up to 150 atm. The rate of combustion increases slowly up to about 20 atm pressure in proportional to the pressure: $u_M = 0.048 p$; then it rises much quicker: $u_M = -7.5 + 0.518 p$ (u_M in $\text{g}/\text{cm}^2 \text{ sec}$; p in kg/cm^2) (Fig. 1). This higher rate is due to turbulent intermittent burning. The aim of the present investigation was to study the zone of transition to intermittent burning. The fact that the higher rate of combustion depends on the turbulence of the combustion front and not only on the increased amount of heat was proved by tests with gelatinous nitroglycol: Throughout the pressure range investigated, a mixture of 97% nitroglycol and 3% Kolloxoline showed a uniform and slow increase of the combus-

Card 1/3

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The influence of pressure ...

tion rate with pressure: $u_M = 0.075 + 0.0315$ (Fig. 2). The combustion products of nitroglycol are NO, CO, CO₂ (approximate ratio 7:1), slight amounts of methane, and possibly formaldehyde. Above a certain pressure - about 10 atm - a secondary flame appears due to the final combustion of NO. The distance between the secondary and primary flames is 18 mm for pure nitroglycol, $p = 12$ atm, and an internal tube diameter of 5 mm - 18 mm. This distance decreases rapidly with increasing pressure: $l = l_0 p^{-1.65}$ (Fig. 6).

For gelatinous nitroglycol, the distance is shorter. For pure nitroglycol, however, this distance begins to vary already at 16-20 atm pressure. Photographs taken with a high-speed camera and a photorecorder have shown that these variations may be regular or irregular. Finally, it is stated that the behavior of the secondary flame does not follow the theory of Ya. B. Zel'dovich and is, thus not decisive for the burning of the liquid. The tendency of the products of combustion to create a secondary flame is attributed not only to thermal but also to more complicated phenomena. According to studies made by I. I. Polyakov, a secondary flame will appear even at lower pressures when tubes of larger diameters are used. The au-

Card 2/4, 7)

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The influence of pressure ...

thors thank S. V. Chuyko for making available some illustrations of his diploma thesis. A paper of A. F. Belyayev and L. D. Komkova is mentioned. There are 13 figures and 1 Soviet-bloc reference.

ASSOCIATION: Akademiya nauk SSSR Institut khimicheskoy fiziki (Academy of Sciences USSR, Institute of Chemical Physics)

SUBMITTED: June 25, 1959

Legend to Fig. 1: (x) p in kg/cm^2 ; (y) u_M in cm. Pressure dependence of the rate of combustion of liquid nitroglycol.

Legend to Fig. 2: (x) p in kg/cm^2 ; (y) u_M in cm; (1) liquid nitroglycol; (2) gelatinous nitroglycol.

Legend to Fig. 6: (x) p in kg/cm^2 ; (y) l in mm; variation of the distance between primary and secondary flames as dependent on pressure: (1) liquid nitroglycol; (2) gelatinous nitroglycol. The zone of intermittent burning is indicated by a broken line.

Card 3/43

27652
S/076/61/035/009/005/015
B106/B110

//2121

AUTHORS: Andreyev, K. K., and Popova, P. P.

TITLE: Burning of pentaerythrytol tetranitrate

PERIODICAL: Zhurnal fizicheskoy khimii, v. 55, no. 9, 1961, 1979 - 1984

TEXT: The authors explain the reasons for the different behavior during burning of pentaerythrytol tetranitrate (PETN) as compared with other nitro esters similar with regard to composition and thermochemical characteristics

The experiments were made on pressed specimens of PETN ($\rho = 1.25-1.30 \text{ g/cm}^3$) at constant pressure in the pressure range of 16 - 750 atm. The experiments at high pressures were conducted by A. P. Glazkova. PETN is comparatively stable to burning; only at a critical diameter of the charge $d = 30 \text{ mm}$, it burns under atmospheric pressure. The burning rate is only $0.023 \text{ g/cm}^2 \cdot \text{sec}$. (0.28 for nitroglycerine and $0.043 \text{ g/cm}^2 \cdot \text{sec}$ for nitroglycol). Only at a pressure of 16 atm steady burning sets in at room temperature and $d = 6 \text{ mm}$. The burning rate is here directly proportional to pressure, and at 30 atm it has a value of $\sim 0.6 \text{ g/cm}^2 \cdot \text{sec}$. For PETN the combustibility is, therefore, much lower than for nitro-glycerin or nitro-glycol. Nor do two

Card 1/4

Burning of pentaerythrytol tetranitrate

27682
S/076/61/035/009/005/015
B106/B110

flames (primary and secondary) appear when PETN burns at pressures above 16 atm, as is characteristic of the burning of nitro-glycol at 10 - 15 atm. During the burning of PETN a lower pressure limit (10 atm at room temperature) occurs, below which burning does not propagate since heat dissipation exceeds heat input. On the other hand, burning of PETN ignited at atmospheric pressure cannot propagate at a pressure increase above a certain upper pressure limit; it is extinguished. At room temperature, this upper pressure limit lies at about 2 atm. The extinction is probably due to a destruction of the temperature distribution in the molten part of the heated layer through beginning autoturbulization according to Landau. This assumption was confirmed by experiments with molten PETN, since its burning is also suppressed at slightly increased pressures. Two flames appear during the burning of molten PETN. The secondary flame which regarding intensity and color reminds of the flame of nitro-glycol, appears at 7 - 8 atm, and keeps a distance of about 2 cm from the surface of the liquid. The absence of this second flame during the burning of solid PETN indicates that the distance between the two flames is reduced much faster with increasing pressure than in the case of nitro-glycol or ethylene glycol dinitrate. The burning rate of liquid PETN does not differ very much from

Card 2/4

Burning of pentaerythrytol tetraxitrate

27682
S/076/61/035/009/005/015
B106/B110

the corresponding value for nitro-glycol. In conclusion, it may be said that the peculiarities during the burning of PETN may be due to the fact that PETN is solid at room temperature. The above-mentioned upper pressure limit may be used for changing burning into explosion. When large amounts of PETN are ignited and the pressure is then increased above the upper critical value, the flame is extinguished, but the heated layer remains and becomes even thicker since exothermic decomposition in it is maintained. Moreover, additional heating by the surroundings heated during burning is also possible. Thus, a flare up of a high amount of explosive may occur which may lead to an explosion, especially when the PETN is in the form of a powder of low density, so that the hot combustion products can penetrate into the interior of the powder. When PETN burns in the molten state, marked pulsation appears at slightly increased pressures (6 - 8 atm), which leads to a strong acceleration of the burning. I. A. Tereshkin is mentioned. There are 3 figures, 1 table, and 3 Soviet references. The reference to the English-language publication reads as follows: G. K. Adams a. G. W. Stocks, Fourth symposium on combustion, The Williams and Wilkins Co., 1953, p. 239. X

Card 3/4

Burning of pentaerythritol tetranitrate

²⁷⁶⁰²
S/076/61/035/009/005/015
B106/B110

ASSOCIATION: Akademiya nauk SSSR Institut khimicheskoy fiziki
(Academy of Sciences USSR, Institute of Chemical Physics)

SUBMITTED: January 9, 1960

Card 4/4

ANDREYEV, K.K.; BESPALOV, G.N.

Thermal decomposition of nitro esters. Part 2: Effect of water on the decomposition of nitroglycerin at elevated temperatures. Zhur.fiz.kham. 35 no.11 2437-2447 N 61. (MIRA 14:12)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni D.I. Mendeleeva.

(Nitroglycerin)
(Water)

5.3610

31183
S/076/61/035/012/002/008
B101/B138

AUTHORS: Andrejev, K. K., and Kaydymov, B. I.

TITLE: Thermal decomposition of nitro esters. III. Thermal decomposition of pentaerythritol tetranitrate

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 12, 1961, 2676 - 2688

TEXT: The decomposition of pentaerythritol tetranitrate (PETN) was studied under various conditions, including the admixture of TNT using a glass Bourdon manometer. (K. K. Andrejev et al., Zh. fiz. khimii, 32, 1726, 1958) and moderate degrees of filling δ (ratio between volume of substance and volume of vessel). (1) Decomposition in the melt (145 - 171°C) is basically the same as with other nitroesters. The initial rate of decomposition of molten PETN is approximately 0.5 that of nitro-glycerin, and 1.5 that of nitro-glycol. The following data were obtained: $E = 39,000$ cal/mole; decomposition rate constant (rate of gas formation) w at 160°C: $6.86 \cdot 10^{-5} \text{ sec}^{-1}$, factor in the Arrhenius equation: $10^{15.6}$. (2) With PETN in solution in TNT, two stages were observed: (a) initial stage with slowly, and (b) with rapidly, accelerating w , the latter due to

Card 1/8

Thermal decomposition of nitro...

31183
S/076/61/035/012/002/008
B101/B138

the hydrolytic effect of the H_2O formed and to the acid decomposition products. This mechanism was not affected by the TNT. TNT only accelerates the destruction of solid PETN if part of it has become liquid. (3) The temperature dependence of the decomposition of PETN is higher in the solid than in the molten state. The function $\log w = f(1/T)$ is no longer linear since partial liquefaction of PETN sets in. (4) The decomposition rate of PETN vapor is at first high, decreasing later. w largely depends on δ . Decomposition of PETN vapor occurs 6 - 8 times more rapidly than liquid. Filling the vessel with glass capillaries did not affect w . (5) The effect of H_2O on solid PETN at $120^\circ C$ was the same as for the solution in TNT. O_2 does not affect the initial w but makes the first stage shorter. $H_2O + O_2$ had an additive accelerating effect on w . From these results it is concluded that: (A) the high stability of PETN is not due to its chemical structure but to its being in the solid state at ordinary temperatures; (B) for maximum stability, the solute impurities must be removed; (C) the kinetics of PETN decomposition are no different from other nitro esters. Maslov who conducted experiments with PETN together with K. K. Andreyev in 1939 - 1940 is mentioned. There are 12 figures,

Card 2/6

Thermal decomposition of nitro...

31123
S/076/61/035/012/002/008
B101/B138

2 tables and 9 references: 3 Soviet and 6 non-Soviet. The two most recent references to English-language publications read as follows:
A. I. B. Robertson, J. Soc. Chem. Ind., 67, 22, 1948; C. E. H. Bawn in Chemistry of the solid state; W. E. Garner, Butterworths Sc. Publ., 1955, p. 254.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskii institut im.
D. I. Mendeleeva (Moscow Institute of Chemical Technology
imeni D. I. Mendeleev)

SUBMITTED: February 17, 1960

X

Card 3/6

20325

S/020/61/137/001/C19/021
B103/B201

11.2121

AUTHORS: Andreyev, K. K. and Kondrikov, B. N.

TITLE: Burning of mixtures of lead azide and liquid nitroethers

PERIODICAL: Doklady Akademii nauk SSSR, v. 137, no. 1, 1961, 130-133

TEXT: A study has been made of the effect of pressure upon the character and the rate of the burning of mixtures consisting of different amounts of lead azide PbN_6 and liquid nitroethers: nitroglycol, nitroglycerin, and nitrodiglycol, which were gelatinized with a small amount of Kolloxoline (3%). Moreover, lead styphnite and potassium picrate were examined instead of PbN_6 as the second component. The behavior of the mixtures was to be studied near the region in which burning turns into a explosion. The mixture was electrically ignited by a nichrome wire in a nitrogen or carbon dioxide atmosphere in a narrow glass tube inside a bomb. Pressure varied from 1 to 70 atm. The type of burning was recorded by a photorecorder or a film camera. Experiments have shown that lead azide-containing nitroglycol mixtures (10% and more PbN_6) in a lower pressure range either are not ignited at all, or are rapidly extinguished or explode
Card 1/5

20325

Burning of mixtures...

S/O20/61/137/001/019/021
B103/B201

after ignition. The more PbN_6 is contained in the mixture, the more readily an explosion may occur. An explosion is also promoted if the nichrome wire penetrates the mixture to a greater depth and does not get in contact with nitroglycol alone. By an increase of pressure it is possible to prevent both extinction and explosion, or to cause the mixture to burn. The higher the azide content, the higher will be also the pressure (p_{cr}) from which on the mixture will be combustible.

$p_{cr} = 4.10 \exp(1.32m) \text{ kg/cm}^2$ holds for this function, m being the PbN_6 content in g/cm^3 . The burning rate is proportional to the pressure:

$u = [a \exp(bm)] p$. If m is expressed in g/cm^3 and p in kg/cm^2 , then

$a = 0.035$, $b = 1.31$. Fig. 1 shows the critical pressures of the mixtures with different PbN_6 contents as well as the dependence of the burning rate on pressure. Fig. 2 shows the effect of the PbN_6 content, of the mode of ignition, and of pressure on the character of the process in the case of nitroglycol. The mixtures of PbN_6 with other nitroethers behave

Card 2/5

20325

Burning of mixtures...

S/O20/61/137/001/019/021
B103/B201

steadiness of burning. This effect is explained in a natural way, basing on the theory (Ref. 2, K. K. Andreev, Proc. Roy. Soc, A246,257,1958) according to which the passage of burning into an explosion on the ignition of an explosive layer is connected with the fact that the chemical reaction covers a certain critical thickness. The explosion of this layer (more precisely, a suspension of explosive particles) effects the explosion of the remaining part of the charge if a sufficiently high pressure jump has been brought about. If this jump is insufficient, extinction or pulsating combustion will be brought about. The explosion of the suspension is also dependent on the time during which the PbN_6 remains

in the heated state. If this time is shorter than the induction period PbN_6 will be burned before inflammation occurs. Nitrodiglycol mixtures containing potassium picrate instead of PbN_6 burn slowly at a low content (5% of potassium picrate) and atmospheric pressure, extinguish between 7 and 20%, and at 24% and over of potassium picrate they burn at a higher rate which rises with rising picrate content. The inability to burn in the intermediate range is explained by the fact that the hot layer is intermixed by microinflammation of the picrate particles. Heat convection is then accelerated, while the evaporation of the nitroether

Card 4/5

Burning of mixtures...

20375

S/020/61/137/001/019/021
B103/B201

requires even more heat. Data obtained by the authors permit a more accurate estimate of the burning rate of PbN_6 than has hitherto been rendered possible by the findings of other researchers. This rate is apparently much lower than that of lead styphnate and approaches that of mercury fulminate (1.5 cm/sec at atmospheric pressure). A PbN_6 rate of 3.5 cm/sec at atmospheric pressure has been found by extrapolation. The conclusion is therefore drawn that the great unsteadiness of PbN_6 burning is associated not only with its high burning rate but also with an intensive dispersion in ignition as well as with the explosion-like combustion of the resulting suspension. Papers by A. F. Belyayev, B. S. Svetlov, and A. Ye. Fogel'zang are mentioned. There are 3 figures and 3 references: 2 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskii institut im. D. I. Mendeleyeva
(Moscow Institute of Chemical Technology imeni D. I. Mendelejev)

Card 5/5

h163h
S/080/62/035/009/005/014
D202/D307

1102-2003119
AUTHOR: Andreyev, K.K.

TITLE: The main factors determining the explosion hazard under mechanical stimuli and methods for its evaluation

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 9, 1962,
1956 - 1960

TEXT: The present work was carried out in view of the lack of precise knowledge of this subject. The present state of this field is described in general terms, concluding that the fundamental properties determining the explosiveness are the inflammability and sensitivity towards detonation. These parameters may be approximately characterized by the critical kinetic combustion and detonation diameters. The effects of fluidity of the compound and of friction on its explosiveness are discussed. In the latter part of the paper the author reviews critically the most convenient laboratory methods used to determine the sensitivity of explosive materials towards mechanical stimulation, mentioning the drop-hammer and friction-sensitivity tests, and concluding that the ability to produce

Card 1/2 ✓

The main factors determining ...

S/080/62/035/009/005/014
D202/D307

heat and pressure by mechanical means in an amount sufficient to result in combustion and explosion depends on the given conditions of deformation and on the ease of deformability of the material. The required stimulus is generally lesser for difficulty deformable substances, and is most conveniently determined by using a 'glancing blow' method, on an apparatus adapted by Kozlov from that of Bowden. It is stressed that Kozlov-Bowden tests should be supplemented by determinations of the inflammability and susceptibility towards detonation.

Card 2/2

ANDREYEV, K.K.; KRIGER, G.E.; KHOTIN, V.G.

Formation of combustible gases in the reaction of aluminum with water
and with solutions of ammonium nitrate. Zhur.prikl.khim. 35 no.11:
2569-2570 N '62. (MIRA 15:12)
(Aluminum) (Ammonium nitrate) (Gases)

ANDREYEV, K.K.

Main reasons for the difference between initiating and secondary explosives. Dokl. AN SSSR 146 no.2:413-414 S '62. (MIRA 15:9)

1. Moskovskiy khimiko-tekhnologicheskii institut im. D.I. Mendeleeva. Predstavleno akademikom V.N. Kondrat'yevym.
(Explosives)

ANDREYEV, K.K., prof., red.; BELYAYEV, A.F., prof., red.; GOL'DINBERG,
A.I., prof., red.; GORST, A.G., prof., red.; YAKIMOV, S.Ya.,
inzh., red.; STEPANOVA, A.A., red. izd-va; NOVIK, A.Ya.,
tekhn. red.

[Theory of explosives]Teoriia vzryvchatykh veshchestv; sbornik
statei. Moskva, Oborongiz, 1963. 578 p. (MIRA 16:4)
(Explosives)

ANDREYEV, K.K.

Transformation of the combustion of explosives into a blast.
Vzryv. delo no.52/9:130-140 '63. (MIRA 17:12)

1. Moskovskiy ordena Lenina khimiko-tekhnologicheskoy institut
imeni D.I. Mendel'eyeva.

ANDREYEV, K.F., ERGIN, V.G.

Factors determining the tendency of coal mining explosives to
burn out. Vopr. delo no. 17/9, 140-151 '63. (MIRA 17,12)

1. Merlovskiy ordena Lenin khimiko-tekhnologicheskij institut
imya L.I. Mendeleeva.

L 18205-63

EWP(q)/EWT(m)/BDS AFFTC/ASD JD

ACCESSION NR: AT3006067

S/2938/63/000/000/0037/0053

AUTHOR: Andreyev, K. K.

55
54

TITLE: Factors determining the origination of explosive by impact and friction and methods of evaluating the sensitivity of an explosive to mechanical action. Factors determining origination of explosion by impact and friction 18

SOURCE: Teoriya vzry*vchaty*kh veshchestv, sbornik statey, 1963
37-53

TOPIC TAGS: explosive , sensitivity of explosive, No. 1 impact tester, No. 2 impact tester, impact testing machine, critical diameter of explosive.

ABSTRACT: Origination of an explosion through mechanical action upon an explosive is determined by the origination of localized heat-ups in the substance. These heat-ups can be formed through a non-uniform flow of the explosive; through contraction of the gas bubbles in the explosive; and, through friction of high-melting admixtures or hard

Card 1/3

L 18205-63

ACCESSION NR: AT3006067

surfaces which contain explosive between them. The development of a chemical reaction, originating in the heat-up centers, to combustion and explosion depends upon the temperature of these centers, their sizes and pressure. The complex of the properties of an explosive must be determined for an integral evaluation of the sensitivity. These include frequency of explosions on the Nos. 1 and 2 impact testing machines, friction testing, ability to transmit the detonation to a distance, critical diameter of the charge during combustion and detonation. It should be kept in mind that the real hazard of the origination of an explosion through mechanical action will also strongly depend upon the conditions of those actions determining the possibility of a flow of the explosive and thus causing localized heat-ups. It also depends upon the maintenance of a pressure conducive to the development of the forming transformation into explosion. "This paper was written in 1956. Certain considerations in this article originated through discussions with N. A. Kholevo, whom the author mentions with deep appreciation." Orig. art. has: no graphics.

Card 2/3

L 18203-63 EWP(r)/EWP(q)/EWT(m)/EDS AFFTC/ASD EM/JD
ACCESSION NR: AT3006068 S/2938/63/000/000/0053/0071

AUTHORS: Andreyev, K. K.; Terebilina, Yu. A. 517

TITLE: Explosion through impact and patterns of sensitivity of explosives to mechanical action. Mechanism of creating an explosion through impact A

SOURCE: Teoriya vzry*vchaty*kh veshchestv, sbornik statey, 1963, 53-71

TOPIC TAGS: explosive , sensitivity of explosive , impact testing machine.

ABSTRACT: Authors proposed a complex method for determining the specific sensitivity of an explosive to mechanical action. The explosive is subjected to impact between the faces of two large-diameter rollers wherein the space encircling the junction of the rollers is open. The amount of weighed portion of the explosive as well as its distribution on the face of the roller is altered. The advantage of this method in comparison to standard ones is the great ability to

Card 1/2

L 18203-63

ACCESSION NR: AT3006068

differentiate chemical and physical factors and an efficient design of the instrument which actually increases its longevity and uniformity of test conditions, and, at the same time, reducing the costs of these tests. Orig. art. has: 3 tables.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14Jun63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 000

OTHER: 000

Card 2/2

L 18207-63 EFR/EPA(b)/EPF(c)/EWT(1)/EWP(q)/EWT(m)/BDS AFFTC/ASD Ps=4/
Pd-4/Pr-4 RM/WW/JD
ACCESSION NR: AT3006069 S/2938/63/000/000/0072/0081

AUTHORS: Andreyev, K. K.; Terebilina, Yu. A. 15

TITLE: Effect of air inclusions upon onset of explosion through shock

SOURCE: Teoriya vzry*svchaty*khveshchestv, sbornik statey, 1963, 72-81

TOPIC TAGS: explosive, air inclusion during explosion, nitroglycerine, lead azide

ABSTRACT: Authors performed experiments to compare the sensitivity of some liquid and solid explosives. The experiments were conducted in a roll-type apparatus. Nitroglycerine, lead azide and other highly-sensitive explosives produced a high explosion frequency when the sphere used for detonation is positioned, not on top of the exploded material, but some distance above it. It was also established that an increase or considerable decrease in the high explosive liquid decreases the explosion frequency. Thus, the

Card 1/2

L 18207-63

ACCESSION NR: AT3006069

results of the experiments are quite sensitive to the conditions of the experiments. This effect apparently is connected with the clamping device, and with the compression and flow of air which results in the ignition of the explosive. Orig. art. has: 3 tables and 4 figures.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14Jun63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 002

OTHER: 003

Card 2/2

L 18206-63 EPR/EPF(c)/EPF(n)-2/EWP(q)/EWT(m)/BDS AFFTC/ASD/IJP(C)
SSD Ps-4/Pr-4/Pu-4 RM/WW/2D
ACCESSION NR: AT3006070 S/2938/63/000/000/0081/0089

AUTHORS: Andreyev, K. K.; Terebilina, Yu. A.

TITLE: Mechanism of onset of explosion during testing for shock sensitivity in roller instrument

SOURCE: Teoriya vzry*vchaty*kh veshchestv, sbornik statey, 1963, 81-89

TOPIC TAGS: explosive, shock sensitivity, shock sensitivity test, impact tester for explosive, No. 1 explosive testing machine, No. 2 explosive testing machine

ABSTRACT: Authors carried out a number of experiments in order to prove that the flow of an explosive in the circular space of a roller instrument can lead to an explosion. They also wanted to gain precise knowledge as to why such a flow will lead to an explosion. They also found that, under ordinary test conditions, even organic, non-explosive substances decompose on the impact tester. This pointed out the fact that the flow during impact leads to a pronounced heat-

Card 1/2

L 18206-63

ACCESSION NR: AT3006070

ing. Two variations of an impact testing instrument were used. One series of tests was carried out to explain the effect of a change in the directional movement of an explosive. Results are shown in a table outlining the various conditions of testing and data obtained through these test modifications. Another series of tests was carried out with a limitation of the efflux of a liquid explosive. A third series of tests were performed under conditions where there was no explosive between the roller faces of the roller machine. Tetryl was used in the tests. Authors conclude that those flow conditions which bring about an explosion in the instrument are very specific and, therefore, the test results produce only a very conditional characteristic of the sensitivity of an explosive. Orig. art. has: 6 figures and 2 tables.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14Jun63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 002

OTHER: 000

Card 2/2

~~U 17251-63~~
 EWP(g)/SWI(h)/BDS AFFIC/ASD JH/vw
 S/2938/63/000/000/0089/0094
 57
 53
 ACCESSION NR: AT3006071

AUTHOR: Andreyev, K. K.

TITLE: Basic factors determining danger of explosives during mechanical actions and methods of its determination

SOURCE: Teoriya vzyvchaty*kh veshchestv, sbornik statey, 1963, 89-94

TOPIC TAGS: explosive, mechanical action an explosive, critical diameter (expl), K-44-111 impact tester, Bowden friction-sensitivity tester

ABSTRACT: The fundamental properties of an explosive which determine its hazard are the thermokinetic characteristics appearing in the critical diameters for combustion and detonation. The possibility of origination of heat and pressure in mechanical actions which are sufficient to start combustion depends upon the specific conditions of deformation and flowability of the material. This possibility is greater for those materials with low flowability and can be

Card 1/2

I. 17951-63

ACCESSION NR: AT3006071

evaluated by a glancing blow on V. S. Kozlov's K-44-111 impact tester.
Orig. art. has: no graphics. 2A 10 4 15

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14 Jun 63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 004

OTHER: 001

Card 2/2

L 17930-63

ACCESSION NR: AT3006072

S/2938/63/000/000/0094/0130

45

AUTHOR: Andreyev, K. K.

TITLE: Some foreign studies concerning the methodology of an experimental determination of an explosive's sensitivity to shock

SOURCE: Teoriya vzry*vchaty*kh veshchestv, sbornik statey, 1963
94-130

TOPIC TAGS: explosive, sensitivity of explosive to shock, impact testing, Kast impact testing machine

ABSTRACT: Studies of American, Swedish and German researches concerning the sensitivity of explosives to shock led them to draw conclusions regarding the very pronounced variabilities in the sensitivities in relation to the test conditions and physico-mechanical properties of explosives. Ordinary impact testing on a Kast machine as well as any other similar testing cannot produce a complete danger pattern of an explosive during transformation. Thus, when selecting a methodology for testing, the physical properties of the substance

Card 1/2

L 17930-63

ACCESSION NR: AT3006072

and nature of those effects which establish the degree of the explosive's hazards must be taken into consideration. New methods for testing an explosive's sensitivity to shock were recommended. This includes testing between two rollers without a coupling for powder-type explosives; between two rollers with coupling and with a small clearance for liquid and gelatin-type explosives; and between rollers and a matched plate, which is suitable for explosives with different physical structures. Orig. art. has: 16 figures and 7 tables.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14 Jun 63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 002

OTHER: 005

Card 2/2

L:17952-63

EPR/EPR(c)/EWT(m)/EBS

AFFIC/RPL

Ps-l/Pr-l

RM/VW/JW/JWD/H

ACCESSION NR: AT3006073

S/2938/63/000/000/0131/0171

70
69

AUTHORS: Andreyev, K. K.; Bespalov, G. N.

TITLE: II. Thermal decomposition of explosives. 9. Effect of water upon the decomposition of nitroglycerine at elevated temperatures

SOURCE: Teoriya varyvchaty*kh veshchestv, sbornik statey, 1963, 131-171

TOPIC TAGS: explosive, thermal decomposition of explosive, nitroglycerine, manometer

ABSTRACT: The effect of water upon the decomposition of nitroglycerine was studied by means of a manometric method. It was found that the presence of water can have a pronounced effect upon the decomposition of nitroglycerine at elevated temperatures. When very small quantities of water are present, the type of nitroglycerine decomposition is the same as the anhydrous decomposition with the exception that the former takes place at a faster rate. In the presence of a

Card 1/2

L. 17952-63

ACCESSION NR: AT3006073

moderate quantity of water, three periods of decompositions are observed: A constant pressure (or induction period), drop in pressure, and an increase in pressure. The larger the quantity of water, the quicker the rise in pressure. In the presence of large quantities of water, the decomposition can be decreased greatly and its maximum rate can be less than the rate of anhydrous nitroglycerine. All these phenomena are explained by the assumption that, in the presence of water, the first stage is hydrolysis. In a neutral medium, the decomposition proceeds slowly, but it is accelerated by the oxidizing products of the anhydrous reaction and by the hydrolysis itself. The hydrolysis leads to an accumulation of nitric acid and organic products which oxidize. This results in hydrolysis which is accompanied by a large separation of gaseous products. Orig. art. has: 28 figures and 8 tables.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14 Jun 63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 006

OTHER: 007

Card 2/2

L 17953-63 EPR/EFF(c)/EWT(m)/BDS AFPTC/RPL Ps-l/Pr-l RM/WW/JW/JWD/H
S/2938/63/000/000/0172/0184

ACCESSION NR: AT3006074

70

AUTHORS: Andreyev, K. K.; Bespalov, G. N.

TITLE: Effect of acids and soda upon decomposition of nitroglycerine in the presence of water

SOURCE: Teoriya vzry*vochaty*kh veshchestv, sbornik statey, 1963, 172-184

TOPIC TAGS: explosive, nitroglycerine, sodium carbonate, nitric acid, oxalic acid, trichloroacetic acid

ABSTRACT: The effect of nitric, oxalic and trichloroacetic acids and sodium carbonate in the presence of water upon the decomposition of nitroglycerine was studied. Small concentrations of nitric acid in the presence of water accelerate the decomposition of nitroglycerine only slightly. When this concentration is increased to multiples of ten, nitroglycerine hydrolyzes quickly. With a further increase in concentration, the oxidation-reduction reactions are also sped up after the hydrolysis. The hydrolysis is also accelerated

Card 1/2

L 17953-63

ACCESSION NR: AT3006074

with oxalic and trichloroacetic acids. At low acid concentrations, the hydrolysis is slowed down as a result of the reducing action of $H_2C_2O_4$ on the products of the "Anhydrous" decomposition. Substances which neutralize the acids such as sodium carbonate or lime in the presence of water prevent a rapid hydrolysis of nitroglycerine and subsequent acceleration of gas formation as a result of oxidation-reduction reactions of the products of hydrolysis. Orig. art. has: 12 figures.

ASSOCIATIONS: None

SUBMITTED: 00

DATE ACQ: 14 Jun 63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 000

OTHER: 000

Card 2/2

I: 18174-63 EPR/EPE(c)/EMT(m)/BDS AFETC/RPL Ps-4/Pp-4 RM/WW/JW/JWD/H
3/2938/63/000/000/0225/0241 69

ACCESSION NR: AT3006081

AUTHOR: Andreyev, K. K.

TITLE: Thermal decomposition of nitroglycerine and its transition into explosion

SOURCE: Teoriya vzry* vchaty* kh veshchestv, sbornik statey, 225-241
1963

TOPIC TAGS: explosives, nitroglycerine

ABSTRACT: The mechanism of thermal decomposition of nitroglycerine and the conditions which determine the possibility of occurrence of ignition as a result of a vigorous self-acceleration of this decomposition were studied. This decomposition, which takes place during the removal or addition of its products, proceeds slowly and without acceleration at low temperatures. It is greatly accelerated if its decomposition products are accumulated. The acceleration will take place much faster if nitroglycerine contains admixtures of water, acid and nitrogen oxides. The special property of this reaction acceleration is that it greatly depends upon the concentration of

Card 1/2

ACCESSION NR: AT3006081

decomposition products or admixtures, and very little depends upon the reaction temperature. As a result of this, if a high concentration of accelerating substances is attained, the decomposition can induce an ignition even at very low temperatures and with comparatively small charges. Orig. art. has: 13 figures and 2 equations.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14Jun63

ENCL: 00

SUB CODE: AR, CH

NO REF SOV: 005

OTHER: 001

Card 2/2

L 18175-63 EFR/EPF(c)/LNT(m)/BDS AEFTC/RPL Ps-1/Pr-1 RM/WW/JW/JWD/H
ACCESSION NR: AT3006082 S/2938/63/000/000/0241/0273

AUTHORS: Andreyev, K. K.; Kaydy*mov, B. I. 73

TITLE: Thermal decomposition of PETN. 7

SOURCE: Teoriya vzry*vchaty*kh veshchestv, sbornik statey, 1963,
241-273

TOPIC TAGS: explosive, PETN, nitroglycerine, nitroglycol, TNT

ABSTRACT: The decomposition of PETN in fusions, in solutions, and in vapor and solid phases was analyzed by a manometric method. The decomposition rate is greater in the vapor phase and smaller in the solid phase. The fusion and the solution of PETN have equal decomposition rates and they occupy an intermediate position close to other nitroethers such as nitroglycerine and nitroglycol. Two macro-decomposition stages are observed in the liquid and solid phases: One with a slightly increasing rate which is not accelerated by the decomposition of gaseous products, and another with a rapid increase in rate as the result of hydrolytic action of the formed water and

Card 1/2

L 18180-63 EPR/EPF(e)/EWT(m)/BDS AFFTC/RPL Pr 4/Ps 4 RM/JW/H/WW/JWD
ACCESSION NR: AT3006087 8/2938/63/000/000/0349/0363

AUTHORS: Andreyev, K. K.; Liu-Pao-Feng

TITLE: Thermal decomposition of picric and styphnic acids

SOURCE: Teoriya vzryvchatykh veshchestv, sbornik statey, 1963, 349-363

TOPIC TAGS: picric acid, thermal decomposition, styphnic acid, picric acid, explosive, nitro-aromatic hydrocarbon

ABSTRACT: Thermal decomposition of picric and styphnic acids was investigated at 183-270C, using a glass manometer. Decomposition occurs in a series of stages distinguished by their rate dependence upon time. On the whole, the reaction takes place without significant acceleration, as distinguished from decomposition of many other nitro-aromatic hydrocarbons. Picric acid decomposes more slowly in the vapor than in the liquid phase; however the reaction is greatly accelerated at the surface of the glass. Orig. art. has: 20 figures.

ASSOCIATION: None.

SUBMITTED: 00

DATE ACQ: 14 Jun 63

ENCL: 00

SUB CODE: CH, AR

NO REF SOV: 004

OTHER: 001

Card 1/1

L 17950-63

EPR/EPF(c)/EWP(q)/EWT(m)/BDS

AFFTC/ASD/RPL

Ps-Li/Pr-Li

RM/

WW/JD/PW/JWD/H

ACCESSION NR: AT3006088

8/2938/63/000/000/0363/0401

AUTHORS: Andreyev, K. K.; Liu-Pao-FengTITLE: Thermal decomposition of ammonium, potassium and lead salts of picric and styphnic acids

SOURCE: Teoriya vzyvchatykh veshchestv, sbornik statey, 1963, 363-401

TOPIC TAGS: explosive, picric acid, styphnic acid, ammonium picrate, ammonium styphnate, potassium picrate, potassium styphnate, lead picrate, lead styphnate

ABSTRACT: The kinetics of the slow thermal decomposition, at temperatures ranging from 170-300C, of ammonium, lead, mono- and di- potassium styphnates and ammonium, lead and potassium picrates were studied. The distinct self-accelerating multi-stage character of their decomposition is schematically presented. The decomposition rate of the salts is lower, and the temperature coefficient for the decomposition rate is larger than the rate and coefficient for the corresponding acids. Decomposition rate of the salts increased from K to Pb to NH_4^+ . Decomposition rate of styphnic acid and the styphnates is significantly greater than that of

Card 1/2

L-17950-63

ACCESSION NR: AT3006088

picric acid and the picrates. No clear correlation was found between the kinetic characteristics of these explosives and their combustibility or the rate of combustion. A hypothesis explaining this phenomenon is presented. Orig. art. has: 3 equations, 9 tables and 42 figures.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 14Jun63

ENCL: 00

SUB CODE: CH, AR

NO REF SOV: 001

OTHER: 000

Card 2/2

L 17918-63
ACCESSION NR: AT3006090
EPR/EPT(G)/EPT(M)/BDS APPS/RPL Pa-L/Pr-L EN/NA/JM/JG/H
8/2938/63/000/000/0404/0416

AUTHOR: Andreyev, K. K.

TITLE: III. Combustion and ignition of explosives.
26. Factors determining the relationship of combustion rate of explosives to initial temperature and pressure

74
67

SOURCE: Teoriya vzry*vohaty*kh veshchestv, sbornik statey, 1963, 404-416.

TOPIC TAGS: explosive, combustion rate of explosive, TNT, picric acid, tetryl, cyclonite, PETN, nitroglycol, nitroglycerine, dinitroxydiethylnitramine

ABSTRACT: The relationship of the combustion rate to pressure for a number of secondary explosives belonging to the nitroester and nitro compound classes approximates a direct proportionality. This is in accordance with the theory proposed by Zel'dovich (ZhETF, 12, 1942, 498) and Belyayev (ZhFKh, 12, 1938, 93; 14, 1940, 1009), that the guiding reaction during the combustion of substances of these classes is bimolecular. The combustion rate of a number of

Card 1/2

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ACCESSION NR: AT3006090

7

explosives can be approximately connected with the heat and combustion temperature by linear relationships. A quantitative analysis of this last relation shows that it has an empirical and approximate character. It was shown through rarefaction of an inert admixture on two substances (PETN and TNT) that the relationship of the combustion rate to its rated temperature is identical by character and coincides with the theoretical, but differs from the quantitative relationship. It is much more pronounced for PETN than for TNT. "The experiments, whose results were utilized in this paper, were carried out by A. P. Glazkova, I. A. Tereshkin and P. P. Popova. The author expresses his gratitude to these people." Orig. art. has: 6 figures, 3 tables and 11 equations.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 14Jun63 ENCL: 00

SUB CODE: AR, CH

NO REF SQV: 007 OTHER: 002

Card 2/2

L 17941-63

EPR/EPR(o)/EWT(1)EWT(m)/BDS

AFPTC/RPL

Pa-4/Pr-4

RM/41/41

8/2938/63/000/000/0495/0498

ACCESSION NR: AT3006097

AUTHORS: Andreyev, K. K.; Khotin, V. G.

TITLE: 33. Factors determining the possibility of explosives burning out in shot holes ✓

SOURCE: Teoriya vvery*vchaty*kh veshohestv, sbornik statey, 1963, 495-498

TOPIC TAGS: explosive, pobedit VP-1, pobedit, ammonite, ammonite PZhV-20

ABSTRACT: The burning out of safety ammonite PZhV-20 and pobedit VP-1 (an ammonium nitrate explosive containing 9% liquid nitro-esters) was studied. Using an ED-8-56 (mercury fulminate-Tetryl) electrodetonator, detonation of these charges, compressed and uncompressed was determined. With uncompressed charges, detonation stopped at similarly small diameters; under high compression PZhV-20 detonated up to 8 mm while the VP-1 diameter rose sharply to 20-26 mm range. It is suggested that these deficiencies in pobedit be

75

Card 1/2

Card 2/2