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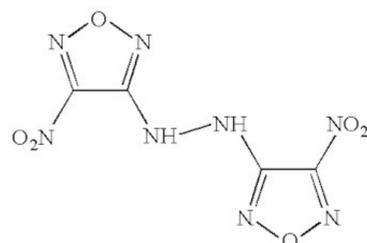
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Dinitro-[di-Furazanyl-Hydrazine]

This compound has a structure of (NO2)(C2N2O)NHNH(C2N2O)(NO2), where (C2N2O) is a furazan ring. It is also known as dinitrohydrazofurazan. This compound probably has a power between RDX and HMX, with a lower sensitivity. The gas products from decomposition would be hotter than that from RDX, but the compound is probably less energetic than the nitramines. The linking hydrazine group may make the compound less chemically and thermally stable than the nitramines, although since the hydrazine is electron donating, it will be less susceptible to oxidation than otherwise. The furazan rings do not lend themselves to aromaticity, so the extent of the hydrazine stabilizing the molecule through electron donation will be severely curtailed. The presence of the hydrazine will allow molecules to pack closer together through hydrogen bonding, the hydrazine also serving to link together two nitrofurazan groups, giving a higher density than the nitramines. 3,3-diamino,4,4-azoxy furazan, which has a structure of NH2(C2N2O)N=N(O)(C2N2O)NH2 has a det. velocity of 8020 m/s, while the same compound, except with a central azo (--N=N--) instead of an azoxy group has a det. velocity of 7600 m/s.



Synthesis:

To 25mL ethanol in a 100mL round bottomed flask, 0.013g (0.00022 moles) glacial acetic acid was added. To this was added 0.05g (0.0002 moles) DinitroAzoFuroxan, and 0.5g iron wire (Zn powder may substitute). This is stirred at refluxed for one hour, then 25mL water and about 1g sodium bicarbonate was added. This was extracted with three 20mL allotments of methylene chloride CH2Cl2. The extracts were washed twice with water and the resulting solution was then dried with anhydrous MgSO4 and filtered. The solvent was removed to leave yellow crystals, which had a melting point over a 160-171degC transition. The compound exothermically decomposes at 215C. If heated rapidly 12deg beyond this, it detonates.

DinitroAzoFurozan Precursor:

In a 250mL round bottomed flask, 0.40g AminoNitroFurazan was dissolved in 16mL concentrated HCl (0.53mol). 0.95g (0.006mol) Potassium permanganate was dissolved in 105mL water. The acid solution in the round bottomed flask was heated to 40degC, then the permanganate solution was slowly dripped into the round botomed flask, over the period of 1 hour. The resulting dark brown solution was heated to a little under 57degC for 2 hours with continued stirring. The solution was cooled, then it was extracted with four 50mL allotments of methylene chloride. The extracts were washed with water, then dried with anhydrous MgSO4 and filtered. The remaining solution was evaporated under reduced pressure until an orange oily liquid remained, which contains Diamino di-Furazanyl-Hydrazine; to crystallize the compound out, it must be repeatedly dried with organic solvent and evaporated, and finally be chilled.

AminoNitroFurazan

100mL flask placed in ice bath and constantly stirred, 56mL 50% H2O2 solution (0.97mol) was added, keeping temperature under 5degC. 5g of sodium tungstate Na2WO4 was added, 1.1g of DiaminoFurazan was added and allowed to react for 12 hours. The resulting yellow solution was neutralized with sodium carbonate until neutral pH was reached. The solution was filtered and extracted, similar to the procedures described above. Yellow Crystals were obtained on evaporation, melting over 120-125degC, with explosion at 170degC.

These are tested procedures, however a theoretical shortcut would be to bubble a limited quantity of NO2 into the furazan of ethylene, giving mono-nitrofurazan, which has a significantly lower vapor pressure than the original reactant, then addition of chlorine will make nitro, chloro furoxan. This will condense with symetric diacetyl hydrazine, and this will slowly hydrolyze in hydrazine hydrate to form Dinitro-[di-Furazanyl-Hydrazine]. Diacetyl hydrazine can be made by treating concentrated N2H4 with Ac2O, no unsymetric diacetyl hydrazine will be produced. Note that both nitrogen dioxide and chlorine react at room temperature with the furazan of ethylene, since double bonds exist on the carbon.

As a sidenote,

In the case with plain ethylene, the reaction with nitrogen dioxide is almost entirely the addition of two nitro groups, breaking the double bond. The reaction of NO2 with the 2-hydroxy propylene (tautomer of acetone) is entirely the oxidation of one of the hydrogens, conserving the double bond.

Other Furazans and Furoxans

See the attachment below for DiaminoFurazan Synthesis

For a related compound, see <http://en.wikipedia.org/wiki/4,4%E2%80%99-Dinitro-3,3%E2%80%99-diazonofuroxan> Dinitroazofuroxan (formula C4N8O8) is thermally unstable, has a detonation pressure of 460kbar, and a detonation velocity of 9.7 km/sec at 1.94 g/cm3.

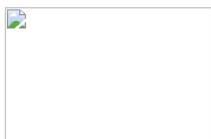
Dinitroazofurazan, O2N(C2N2O)N=(C2N2O)NO2, has a melting point of 56degC, and a density of 1.73g/cm3, with an observed heat of formation of 168.4 kcal/mol. heat of combustion: 2.125 kcal/g

Dinitroazoxyfurazan, O2N(C2N2O)N+([--O-])=N(C2N2O)NO2, has a melting point of 112degC, and a density of 1.82g/cm3, with an observed heat of formation of 154.7 kcal/mol. heat of combustion: 1.952 kcal/g

The --N=N-- can be oxidized to azoxy --N=N(O)-- using ammonium persulfate with oleum (conc H2SO4 enriched with SO3) between 80-90degC.

4,4'-diamino-3,3'-azofuroxan has the structure NH2(C2N2O2)N=N(C2N2O2)NH2.

3, 3-diamno-4,4-azoxyfurazan (DAAF)



Explosive characteristics: Velocity of detonation (at a density of 1.69 g/cc) 8000 m / sec. Pressure of the explosion about 299 kbar at a density of 1.69 g / cm.

Physical properties: Оранжево-желтые кристаллы. About Ranjeva yellow crystals. Practical density of 1.69 g / cm. Temperature at which decomposition begins: 248 degC.

Synthesis: A 500ml flask was poured into 100 grams of 30% hydrogen peroxide at 18C and added in 10 minutes 55 grams 98% sulfuric acid with active stirring. Next, the mixture is made by 10 grams of 3,4-diaminofurazan and actively stirred for 24 hours. DAAF precipitates in the form of orange crystals which are filtered and washed with water. Impure product dissolved in 22 ml DMSO, which is then diluted with 45 ml water and filtered clean DAAF.

This compound is a precursor for is for the synthesis of DAAzF. (confusingly DAAF= diaminozoxyfurazan, while DAAzF= diaminoazofurazan, without the extra oxygen atom on the diazo bridge which connects the two rings)

Orange-yellow crystals. Insoluble in water. Thermally stable up to 248 ° C. Almost insensitive to the impact (more than 320 cm for a 2.5 kg load), friction and static electricity. Critical diameter of detonation of 3mm. Detonation velocity and pressure at the front of the detonation wave acc. 8020m / sec at 1.69 g/cm3 and 29.9 GPa. Heat of formation of 106 kcal / mol. A good press Density of 1.747 g/cm3. Prepared by oxidation of 3,4-diaminofurazan by hydrogen peroxide and 88% sulfuric acid, with a yield of 88%. A potential low cost production insensitive explosive. Known also similar to the properties of 3,3 '-diamino-4, 4'-azofurazan DAAzF H 2 N (C 2 N 2 O)-N = N(C 2 N 2 O) NH 2 - dark orange crystals are almost insensitive to shock (over 320 cm for a 2.5 kg load), friction and static electricity. In terms of thermal stability it is close to Hexanitrostilbene. Detonation velocity and pressure at the front of the detonation wave acceleration 7600m / sec at 1.65 g/cm3 and 26.2 GPa. A good press Density of 1.72 g/cm3. For the synthesis of **3,3 '-diamino-4,4'-azoxy furazan** to 3,3'-diamino-4,4'-azofurazan, zinc dust in a mixture of glacial acetic acid and methanol. 3,3 '-diamino-4, 4'-azofurazan then oxidized to DAAzF. The total yield of DAAF approximately 92%. A potentially heat-resistant insensitive explosive. Some derivatives furazano and furoxan are of considerable interest as components of high explosives and propellants. It is usually fairly stable liquid or solid yellow or colorless. High-density. good resistance to impact.. Dinitrofurazanovy ether [(O 2 N) C 2 N 2 O] 2 O t pl. 62°C. 62 ° C. Density of 1,907 g/cm3. Heat of formation of 73 kcal / mol. Detonation velocity of 9.2 m / c at 1.9g/cm3. Can be obtained by heating 3,4-dinitrofurazan in acetonitrile in the presence of carbonate. Dinitroazoxyfurazan (O 2 N) (C 2 N 2 O) N (O) = N (C 2 N 2 O) (NO 2) t pl. 112°C. 112 ° C. t разл ок 206°C. decomposition temperature: roughly 206 ° C. Density of 1.82 g/cm3. Heat of formation of 155 kcal / mol. Detonation velocity of 9.02 m / sec at 1.78g/cm3. Can be obtained by oxidation of 3,4-diaminofurazan. 4,4 '-dinitro-3, 3'difurazan [(O 2 N) C 2 N 2 O] 2 t pl. 85°C. Thermally stable up to 250 ° C. Sensitive to impact, friction and fire. Sensitivity to shock is roughly 12 cm. Heat of formation of 101 kcal / mol. Calculated detonation velocity 8650 m / sec at 1.8 g/cm3. Density 1.85g/sm3. Can be obtained by oxidation of 4,4 '-diamino-3,3'-difurazan mixture of concentrated hydrogen peroxide and trifluoroacetic acid.

furazans

dinitrofurazan C 2 N 4 O 5 , molar weight 160,05, melting point (minus) -15 ° C, density 1.62 g/cm 3
 heat of formation 55kcal/mol
 detonation velocity 7.98 km/sec

diaminofurazan C2N4H4O density: 1.61 g/cm3

azenonitrofurazan O2N(C2N2O)N=(C2N2O)NO2 melting point: 56degC.

azoxynitrofurazan molar weight: 272.09, melting point 112degC, heat of formation: 155kcal/mol, calcdated density 1.82g/cm3 detonation velocity: 9.02 km/sec (at a density of 1.72g/cm3)

C4N8O4 molar weight 224, melting point 35 degC, heat of formation 201 kcal/mol density: 1.91 g/cm3, detonation velocity: 9.16 km/sec (at a density of 1.84g/cm3)

С

energetic_glyoxime_and_diaminofurazan_deriva... Anders Hoveland, Oct 12, 2010, 8:23 PM

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Comments