含能快递

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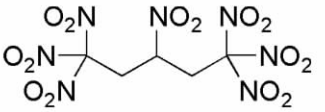
**A brief review of publications of Russian scientists on energy materials and processes. Part 1.**

*Russian Chemical Bulletin*, **2011**, 60, N 1, 36-41
Published in Russian in *Izvestiya Akademii Nauk. Seriya Khimicheskaya*, 2011, No. 1, pp. 37–41
Cite this: ***Russ. Chem. Bull.***, 2011, **60**, 36-41 | DOI: 10.1007/s11172-011-0005-2

## Bond Energies and the Enthalpies of Formation of Mono- and Polyradicals in Nitroakanes 3. Nitroalkanes C4—C7

E. A. Miroshnichenko, T. S. Konŕkova, Ya. O. Inozemtsev, and Yu. N. Matyushin

The enthalpies of formation of nitroalkanes C4—C7 in the standard state and in the gas phase were recommended based on the experimental data. The dissociation energies of bonds in these compounds were determined taking into account the enthalpies of atomization and the energies of nonvalent interactions of nitro groups. The calculated values were compared with the kinetic data on thermal decomposition. Regularities of changes in the bond dissociation energies of nitroalkanes C1—C7 and their radicals are established.

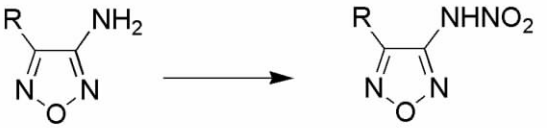


*Russian Chemical Bulletin*, **2011**, 60, N 2, 334-338
Published in Russian in *Izvestiya Akademii Nauk. Seriya Khimicheskaya*,2011, No. 2, pp. 327–331
Cite this: ***Russ. Chem. Bull.***, 2011, **60**, 334-338 | DOI: 10.1007/s11172-011-0054-6

## Nitration of Primary Aminofurazans with Aqueous Nitric Acid

V. P. Zelenov and A. A. Lobanova

A convenient procedure for the synthesis of nitroaminofurazans by nitration of primary 3-amino-4-R-furazans (R = Me, $NO_2$, phenyl, methyl-*NNO*-azoxy, *tert*-butyl-*NNO*-azoxy, *tert*-butyldiazenyl, *etc.*) with 66—77% aqueous nitric acid was developed. Yields of the products were 80—99%.

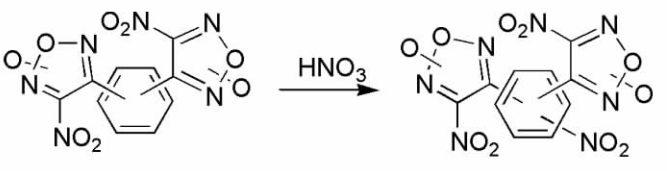


*Russian Chemical Bulletin*, **2011**, 60, N 2, 339-344
Published in Russian in *Izvestiya Akademii Nauk. Seriya Khimicheskaya*,2011, No. 2, pp. 332–337
Cite this: ***Russ. Chem. Bull.***, 2011, **60**, 339-344 | DOI: 10.1007/s11172-011-0055-5

## Synthesis of Isomeric 1,3- and 1,4-*bis*[3(4)-nitrofuroxan-4(3)-yl]-nitrobenzenes by Nitration of the Corresponding Isomeric 1,3- and 1,4-Bis[3(4)-nitrofuroxan-4(3)-yl]benzenes

A. O. Finogenov, M. A. Epishina, I. V. Ovchinnikov, A. S. Kulikov, I. V. Anan'ev, N. N. Makhova

Isomeric 1,3- and 1,4-*bis*[3(4)-nitrofuroxan-4(3)-yl]nitro(dinitro)benzenes were synthesized by nitration of the corresponding 1,3- and 1,4-*bis*[3(4)-nitrofuroxan-4(3)-yl]benzenes with a mixture of 100% $HNO_3$ and conc. $H_2SO_4$ in high yields. The influence of 3- and 4-nitrofuroxanyl moieties on the regioselectivity of the nitration was revealed. The structure of 1,3-*bis*(4-nitrofuroxan-3-yl)-4-nitrobenzene was confirmed by X-ray diffraction analysis.

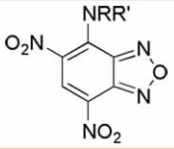


*Journal of Analytical Chemistry*, **2011**, 66, N 7, 585-589
Published in Russian in *Zhurnal Analiticheskoi Khimii*, 2011, vol. 66, No. 7, pp. 698–702
Cite this: ***J. Analyt. Chem.,*** 2011, **66**, 585-589 | DOI: 10.1134/S1061934811070069

## Efficiency of Separating Amine 5,7-Dinitrobenzofurazane Derivatives

M. I. Evgen'ev, I. I. Evgen'eva, F. S. Levinson, and Ya. R. Valitova

The influence of eluent properties, water concentration in an aqueous–organic mixture, and pH on the retention of 5,7-dinitrobenzofurazan derivatives of a set of aromatic amines under the conditions of RP HPLC was revealed. A procedure for the separation of a mixture of six aromatic amines on a column ZORBAX SB_C18 was developed.

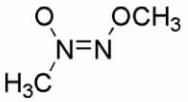



*Kinetics and Catalysis*, **2011**, 52, N 1, 17-25
Published in Russian in *Kinetika i Kataliz*, 2011, vol. 52, No. 1, pp. 19–27
Cite this: ***Kinet. Catal.,*** 2011, **52**, 17-25 | DOI: 10.1134/S0023158411010228

## Kinetics of Methoxy-NNO-Azoxymethane Hydrolysis in Strong Acids

I. N. Zyuzin and D. B. Lempert

The kinetics of methoxy-NNO-azoxymethane hydrolysis in concentrated solutions of strong acids (HBr, HCl, $HClO_4$, and $H_2SO_4$) has been investigated by a manometric method.




*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 41-44
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 1, pp. 20–24
Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 41-44 | DOI: 10.1134/S1990793111010118

## Tendencies in the Development of Studies of High Explosives

V. I. Pepekin

An energy-content-based criterion of assessing the detonability of organic high explosives was proposed. The energy content of energetic materials was demonstrated to be a quantitative measure of the detonability, which can be estimated using the chemical composition and enthalpy of formation.

*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 45-56
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 1, pp. 25–37
Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 45-56 | DOI: 10.1134/S1990793111010088

## Transient Modes of Double-Base Propellant Combustion in a Semiclosed Volume

V.N. Marshakov and B.V. Novozhilov

Experimental data on the transient combustion of double-base propellants in a semiclosed space are described. The transient process was initiated by a sharp change in the cross sectional area of the nozzle. The pressure in the combustion chamber at various ratios between the initial and final cross sectional areas of the nozzle was measured. An attempt to explain the experimental data obtained within the framework of the phenomenological theory of non-steady-state combustion of energetic condensed systems was undertaken. A comparison of experimental and theoretical results demonstrates their satisfactory agreement.

*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 67-74
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 1, pp. 48–55

Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 67-74 | DOI: 10.1134/S1990793111010027

## Laser Initiation of PETN in the Mode of Resonance Photoinitiation

E.D. Aluker, N.L. Aluker, A.G. Krechetov, A.Yu. Mitrofanov, D.R. Nurmukhametov, V.N. Shvaiko

The effect of the initial temperature of a sample on the efficiency of laser initiation and on the duration of the preexplosion stage (induction period) of PETN was studied. An analysis of the results leads to the conclusion that, in the initiation of PETN with the first harmonic of a neodymium laser (1060 nm), a new selective resonant mode of photoinitiation is realized.

*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 84-96
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 2, pp. 28–41

Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 84-96 | DOI: 10.1134/S1990793111020138

## Combustion of Aluminum–Magnesium Alloy Particles under Microgravity Conditions

A.A. Zenin, G.P. Kuznetsov, and V.I. Kolesnikov

The combustion of 200- to 600-μm single particles of 0.85 Al/0.15 Mg and 0.15 Al/0.85 Mg alloys in the $CO_2$ and $O_2$-$N_2$ (20: 80) media at pressures of 0.1 to 4.0 MPa was studied. The combustion occurred in a free-falling combustion chamber after ignition with a ruby laser. The specificity of the mechanism of the combustion of particles of these alloys was identified, and the combustion times of particles are determined. The character of this process (luminescence pulsations, fragmentation, etc.) was examined, and the solid combustion products were analyzed.

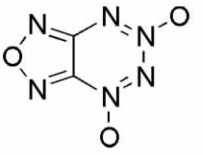
*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 97-100
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 2, pp. 42–45

Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 97-100 | DOI: 10.1134/S1990793111020102

## Enthalpy of Formation and Explosive Properties of 5,6-(3,4-Furazano)-1,2,3,4-Tetrazine-1,3-Dioxide

V. I. Pepekin, Yu. N. Matyushin, and T. V. Gubina

The enthalpy of formation of 5,6-(3,4-furazano)-1,2,3,4-tetrazine-1,3-dioxide was determined, and the parameters of detonation, energetics, and performance characteristic were estimated.



*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 116-123
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 2, pp. 62–69

Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 116-123 | DOI: 10.1134/S1990793111020060

## Characteristics of the Underwater Explosion of a Nonideally Detonating Aluminum-Rich Energetic Material

P.V. Komissarov, G.N. Sokolov, and A.A. Borisov

An experimental study of characteristics of the explosion of mixtures of ammonium perchlorate, aluminum, and nitromethane with a large excess of aluminum (1.45 to 1.66 g/cm$^3$ in density) confined in plastic enclosures and immersed in small elastic-wall reservoirs with water was conducted. It was shown that composite charges, 20 mm in diameter, surrounded by a water layer of thickness 20–30 cm and detonate in a nonideal detonation mode. High-speed cinematography records show the possibility of the intense mixing of the detonation products with the surrounding water and of the burning of excess aluminum particles in a heterogeneous cloud.

*Russian Journal of Physical Chemistry* B, *Focus on Physics*, **2011**, 5, N 1, 163-167
Published in Russian in *Khimicheskaya Fisika*, 2011, vol. 30, No. 1, pp. 89–93

Cite this: ***Russ. J. Phys. Chem. B,*** 2011, **5**, 163-167 | DOI: 10.1134/S1990793111010076

## Peculiarities of the Decoration of Carbon Nanotubes with Transition Metal Atoms

A.A. Kuzubov, P.O. Krasnov, T.A. Kozhevnikova, M.N. Popov, and P.V. Artyushenko

Carbon nanotubes decorated with transition metal, in particular, scandium, titanium, and vanadium, atoms offer promise for use in various applied science fields. Results of quantum-chemical calculations of the structure of the metallic layer of atoms of these metals coating the surface of (9, 0) and (10, 0) carbon nanotubes were described. It was shown that uniform one-layer coating by scandium and titanium could form on nanotubes with diameters no less than the diameter of (10, 0) nanotubes. Vanadium atoms could not uniformly cover nanotubes irrespective of their diameters.

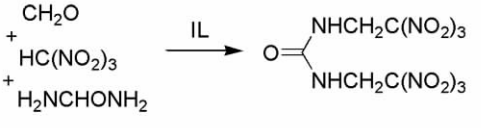
*Mendeleev Communications*, **2011**, 21, N 1, 21-23

Cite this: ***Mendeleev Commun.,*** 2011, **21**, 21-23 | DOI: 10.1016/j.mencom.2011.01.009

## Henry and Mannich Reactions of Polynitroalkanes in Ionic Liquids

M. A. Epishina, I. V. Ovchinnikov, A. S. Kulikov, N. N. Makhova, V. A. Tartakovsky

Based on Henry and Mannich reactions of polynitroalkanes for the first time implemented in ionic liquids, ecologically pure and safe methods for the synthesis of polynitro alcohols and *N*-2,2,2-trinitroethyl derivatives of low basic amino compounds (urea, acetamide, 4-amino-3-methylfuroxan) have been elaborated.




（以上信息由俄罗斯 N. D. Zelinsky Institute of Organic Chemistry 的 Aleksei B. Sheremetev 博士供稿）

## 抑制硅粉分散过程中产生氢气的一种方法

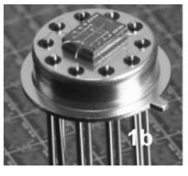
硅粉可以用于矿用雷管延迟起爆的配方中作燃料组分，在水相分散硅粉的加工过程中，因水中含有少量的氧气，可以反应释放出具有爆炸危险性的氢气。为了抑制氢气的产生，近来南非 University of Pretoria 的研究人员研究了在环境温度下介质的 pH 值和硅粉表面处理对硅粉腐蚀速度影响。他们发现氢气的产生速度随 pH 值的增加而增快，并证明用有机硅烷对硅粉表面进行包覆比醇类对硅粉的处理更有能力抑制硅粉的腐蚀，乙烯基三(2-甲氧基乙氧基)硅烷得到的效果最佳。当用铬酸铅作氧化剂，对比包覆与未包覆的硅粉的燃烧行为，发现硅烷包覆的硅粉其燃烧性能较差，这归因于包覆硅粉与氧化剂表面能的不匹配，因此需要对氧化剂的表面进行处理，使它们能更加紧密的混合在一起。

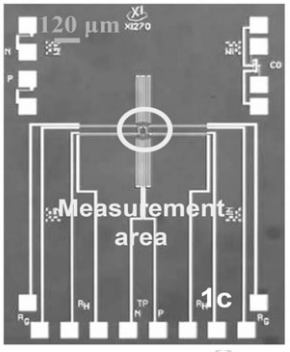
(*Tichapondwa S M, Focke W W, Fabbro O D, et al. Suppressing H2 evolution by silicon powder dispersions [J]. Journal of Energetic Materials, 2011, 29(4): 326 -343.*)

## 法国同行用纳量热法研究炸药材料的热行为

近来，法国同行们研制出炸药材料的纳量热(Nanocalorimetry)分析，它的主要优点在于它有极高的加热速率(达 $10^6$℃/s)，并具有表征单个炸药微晶可能性。图 1a 给出放置在他们实验室的纳量热分析设备，样品放置在纳量热传感器(图 1b)的测试区域的中心处(图 1c)。该类型的纳量热法分析可以记录加热速率下含能材料单个微晶热热行为，这更接近宏观样品的真实爆轰过程。

(*Piazzon N, Bondar A, Anokhin D, et al. Thermal signatures of explosives studied by nanocalorimetry [C] // 42nd International Annual Conference of ICT, Karlsruhe, Germany, 2011, 7 -1 ~7 -9.*)

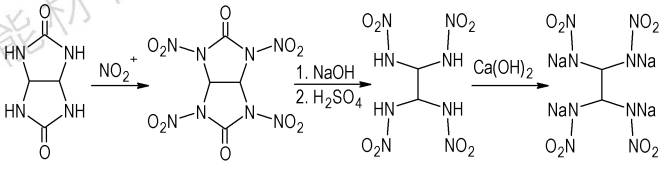




## 波兰研究人员合成出 1,1,2,2-四硝胺基乙烷四钠盐

1,1,2,2-四硝胺基乙烷四钠盐($Na_4TNAE$)是一种新型稳定的高能密实的炸药，计算(最大理论密度)爆速和爆压分别为 10.9 km/s 和 42.7 GPa，爆轰能量为 7081 kJ/kg，是至今已知含能材料分子中最高的。其摩擦感度大于 360 N，撞击感度为 6 J，可以不用添加剂进行冷压。可在固体推进剂和特殊烟火剂中作氧化剂。近来，波兰研究人员采用 TNAE 与 NaOH 在甲醇中反应，制得 $Na_4TNAE$。TNAE 可以通过 1,3,4,6-四硝基甘脲的碱性水解制得。$Na_4TNAE$ 的 DSC 结果显示其分解温度为 465 K，燃烧试验显示燃烧很快，并伴随噼噼啪啪的响声；在氧气中测试的 $Na_4TNAE$ 燃烧热为 2090 kJ/mol，生成焓为 +190 kJ/mol。

(*Mateusz Szala, Leszek Szymańczyk. Synthesis and properties of tetrasodium salt of 1, 1, 2, 2-tetranitroaminoethane [C] // 42nd International Annual Conference of ICT, Karlsruhe, Germany, 2011: 40 -1 ~40 -6.*)




(张光全 编译)