THERMAL DECOMPOSITION OF MONOCYCLIC NITROPYRAZOLES

A. N. Pivkina[1], A. A. Bragin[1], N. V. Muravyev[1], K. A. Monogarov[1], O. S. Gryzlova[1], T. K. Shkineva[2], and I. L. Dalinger[2]

[1]N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation
[2]N. D. Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences, 47 Leninsky Prosp., Moscow 119991, Russian Federation

Abstract: Among the promising high-energy materials, the fully nitrated five-membered heterocycles (pyrazoles), polynitropyrazoles in particular, have been actively studied recently. Polynitropyrazoles have high density and formation enthalpy values as well as reduced mechanical sensitivity. Thermal stability of the first members of high-energy polynitropyrazoles row: 3,4-dinitropyrazole, 3,5-dinitropyrazole, and 3,4,5-trinitropyrazole has been systematically studied under atmospheric and increased pressures. The use of increased pressure allowed to reduce the influence of evaporation process and determine the temperature and heat effect value of 3,5-dinitropyrazole decomposition, which exceeds the same value for HMX. For the first time, gas evolving stages were estimated and gas products were identified for each stage. As a result, the probable thermal decomposition pathway for the investigated materials was suggested.

Keywords: nitropyrazoles; thermal analysis; high-pressure calorimetry; FTIR spectrometry; evolved gases analysis.

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Contributors

Pivkina Alla N. (b. 1958) — Doctor of Science in technology, head of laboratory, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; alla_pivkina@mail.ru

Bragin Anatoly A. (b. 1988) — junior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; anatoliybragin@gmail.com

Muravyev Nikita V. (b. 1985) — Candidate of Science in technology, senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; muravyev-nikita@yandex.ru

Monogarov Konstantin A. (b. 1982) — senior research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; kostyk3d@mail.ru

Gryzlova Olga S. (b. 1986) — research scientist, N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; olga_ord@mail.ru

Shkineva Tatiana K. (b. 1965) — Candidate of Science in chemistry, research scientist, N. D. Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences, 47 Leninsky Prosp., Moscow 119991, Russian Federation; tanya_shkineva@mail.ru

Dalinger Igor L. (b. 1961) — Doctor of Science in chemistry, leading research scientist, head of laboratory, N. D. Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences, 47 Leninsky Prosp., Moscow 119991, Russian Federation; dalinger@ioc.ac.ru