DICYANOMETHYL AND DITETRAZOMETHYL DERIVATIVES OF BISFURAZANOPIPERAZINE AS POTENTIAL SOLID FUEL DISPERSANTS FOR GAS GENERATOR ENGINES

D. B. Lempert[1], D. V. Dashko[2], A. I. Kazakov[1], E. L. Ignatyeva[1], and A. V. Nabatova[1]

[1] Federal Research Center for Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, 1 Prosp. Academician Semenov, Chernogolovka, Moscow Region 142432, Russian Federation
[2] Federal State Unitary Enterprise Special Design Bureau "Technologue," 33-a Sovetsky Prosp., St. Petersburg 192076, Russian Federation

Abstract: New energy-intensive compounds 4,8-dicyanomethyl-4H,8H-difurazano[3,4-b:3′,4′-e]piperazine (DCMFP) and 4,8-ditrazolomethyl-4H,8H-difurazano[3, 4-b:3′,4′-e]piperazine (DTMFP) have been synthesized for the first time. The synthesis of these compounds is described. Both compounds were studied as possible dispersants of solid fuels for gas generator engines, their densities, enthalpies of combustion and formation, sensitivity to impact and friction were determined (for DCMFP, the sensitivity is very low, at the level of TNT; for DTMFP, at the level of HMX), the ballistic efficiency of solid fuels was estimated based on DCMFP and DTMFP (against 7-amino-7*H*-difurazano[3,4-b:3′,4′-*f*]furoxano[3″,4″-*d*]azepine, Az(O)NH_2 the first wins 4%, the second loses $\sim$ 1.5%). A comparison was also made with a number of other dispersants developed over the past few years. Preliminary testing of DCMFP and DTMFP for thermal stability was carried out by DTA in a nonisothermal mode, it was shown that these components are very stable, the so-called temperature of the beginning of intensive decomposition is 312 and 270 °C, respectively.

Keywords: solid propellants (SP); gas generator engine (GGE); dispersant; synthesis; dicyanomethyldifurazanopiperazine (DCMFP); ditrazolomethyldifurazanopiperazine (DTMFP); enthalpy of formation; ballistic efficiency; sensitivity; thermal stability

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Figure Captions

Figure 1 Some of the previously considered dispersants [4–7]

Figure 2 Bisfurazanopiperazine and its substituted derivatives investigated in the present work

Figure 3 Derivatogram of nonisothermal decomposition of DCMFP (*a*) and DTMFP (*b*)

Table Caption

The composition of the studied gas mixtures

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Contributors

Lempert David B. (b. 1946) — Doctor of Science in chemistry, chief research scientist, Federal Research Center for Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, 1 Prosp. Academician Semenov, Chernogolovka, Moscow Region 142432, Russian Federation; lempert@icp.ac.ru

Dashko Dmitry V. (b. 1965) — Candidate of Science in chemistry, head of Scientific and Production Complex, Federal State Unitary Enterprise Special Design Bureau "Technologue," 33-a Sovetsky Prosp., St. Petersburg 192076, Russian Federation; ddv65@bk.ru

Kazakov Anatoly I. (b. 1950) — Doctor of Science in chemistry, chief research scientist, Federal Research Center for Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, 1 Prosp. Academician Semenov, Chernogolovka, Moscow Region 142432, Russian Federation

Ignatyeva Elena L. (b. 1957) — Candidate of Science in chemistry, research scientist, Federal Research Center for Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, 1 Prosp. Academician Semenov, Chernogolovka, Moscow Region 142432, Russian Federation

Nabatova Albina V. (b. 1946) — research scientist, Federal Research Center for Problems of Chemical Physics and Medicinal Chemistry of the Russian Academy of Sciences, 1 Prosp. Academician Semenov, Chernogolovka, Moscow Region 142432, Russian Federation