

(>36 kg, BAM) 不敏感。DAAzF 的爆速和爆压低于 DAAF。

为了改善 TATB/HNS 配方安全性差的缺点, 美国研制了 50% DAAzF 和 50% TATB 的炸药配方。在直径为 0.5 英寸、0.25 英寸条件下, 检测了爆速和密度之间的关系, 预测 DAAzF/TATB 的性能优于 TATB/HNS(重量百分比相同)。

4.2 3,3'-偶氮二(6-氨基-1,2,4,5-四氮烯)(DAAT)^[17]

富氮化合物 DAAT 是一种新型对热稳定的不敏感炸药, DAAT 具有不寻常的热稳定性, 对摩擦和撞击不敏感。DAAT 具有高氮含量 76%、低氧平衡 -72.67%, 高生成热 +1 035 kJ · mol⁻¹。美国报道的密度为 1.84 g · cm⁻³。在较高的温度下分解(255 °C), 释放高热(658 ± 21) kJ · mol⁻¹。DAAT 的合成成分六步进行, 总产率超过 20%, 尽管 DAAT 反应步骤多, 但是制备不太难, 可以很容易地在多克量规模制备 DAAT, DAAT 有潜力用做新型含能材料。

5 小结

从本文列举的十余种新型不敏感单质炸药来看, FOX-7 应用前景最好, 2,6-二氨基-3,5-二硝基吡嗪-1-氧化物在不敏感弹药中也有希望得到应用, 因为这两种化合物的能量较高, 而且感度适中, 热稳定性好。

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Progress in Studies on Benzofuroxan Compounds

ZHOU Hong-ping, DONG Hai-shan, HAO Ying

(*Institute of Chemical Materials, CAEP, Mianyang 621900, China*)

Abstract: The chemical structures, syntheses, properties, and applications of benzofuroxan compounds are reviewed. This paper mainly consists of three parts. The first part describes three synthetic routes used for benzofuroxans, i. e. thermolysis or photolysis of *o*-nitro-azidobenzene and its derivatives, oxidation of *o*-nitroaniline and its derivatives and oxidation, oximation and cyclization of oxophenic acid. The second part summarizes the property data of 17 benzofuroxans, including density, melting point, decomposition temperature, detonation velocity and detonation pressure etc. The third part gives some examples of benzofuroxan compounds' application in primary explosives, PBXs, and propellants. In addition, the authors have put forward a few proposals concerning the further researches on benzofuroxan explosives.

Key words: organic chemistry; benzofuroxan; review; structure; synthesis; property; application

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Development on Some New Insensitive Individual Explosives Abroad

WANG Zhen-yü

(*Xi'an Modern Chemical Research Institute, Xi'an 710065 China*)

Abstract: The syntheses and performances of some new insensitive individual explosives are introduced, including nitro-compound explosives FOX-7, LLM-105, MTNI, 4,6-nitroanilinodinitrobenzofuroxans, PL-1, LLM-116, ANTZ, nitramine explosives I-RDX, TEX and other explosives DAAT, DAAF, DAAzF. The detailed synthetic procedures and a few PBX's formulations based on the insensitive explosives mentioned above are given, especially those for FOX-7 and LLM-105. In addition, some reference data concerning the properties of a number of insensitive explosives are summarized in this paper. FOX-7 and LLM-105 are attractive for applications in insensitive munitions due to their high energy level, moderate sensitivity, and good thermal stability.

Key words: material science; insensitive explosive; review; FOX-7; LLM-105