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(54) **PRESSED INSENSITIVE EXPLOSIVE MIXTURE**

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(57) **ABSTRACT**

Insensitive explosive mixtures of octogen, hexogen crystals have a bimodal grain composition comprising coarse grain of 280-360 μm and fine grain of 15-45 μm and a binder system HYTEMP® and DOA using a conventional solvent. Explosive mixtures are obtained, which are of differing sensitivity and which in the GAP test attain the classification of little sensitivity in accordance with STANAG 4170.

PRESSED INSENSITIVE EXPLOSIVE MIXTURE

[0001] The invention relates to pressed insensitive explosive mixtures as set forth in the classifying portion of claim 1.

[0002] Explosive mixtures of that kind are known from DE 199 55 657 A1. Explosive crystals such as hexogen, octogen and CL20 have a binder matrix comprising sonochemically produced very fine TATB (1,3,5-triamino-2,4,6-trinitrobenzene). That provides that the explosive was classified in accordance with the GAP test as involving little sensitivity. The pressing force required is >2 kbars.

[0003] The object of the present invention is to propose insensitive explosive mixtures which are of the utmost simplicity to produce and which, with the lowest possible pressing pressures of markedly <1 kbars, acquire of the theoretical maximum density >98%, and therefore have a very high pressed body density.

[0004] The invention attains that object in accordance with the features according to the invention as set forth in claim 1. Advantageous developments of the invention are set forth in the appendant claims.

[0005] Advantageously, besides insensitivity, the invention achieves high charge densities, in regard to high detonation pressures and speeds. By virtue of the low pressing pressure involved, the explosives can be readily pressed into complicated housings. With the low pressing pressures involved, crystal breakages of the explosive are avoided. The use of inexpensive octogen and hexogen of quality B is problem-free.

[0006] The charges are recyclable in the sense of fresh granulation.

[0007] Embodiments:

EXAMPLE 1

[0008] octogen mixture with 8% of binder system near the sensitivity limit in accordance with TL (TL=1376-800)

[0009] bimodal grain composition

[0010] coarse grain mean grain size 280-360 μm

[0011] fine grain 15 μm

[0012] solvent for binder system HYTEMP® and DOA in a quantitative ratio of 1:3

[0013] acetone 3-10 times mass of the binder system

[0014] pressing pressure for the explosive mixture with a tool of 50 mm diameter: 1.5 kbars.

[0015] Result:

[0016] Non-initiation ≦31 kbars.

EXAMPLE 2

[0017] octogen mixture with 8% of binder system with a marked distance in relation to the sensitivity limit in accordance with the above-mentioned TL.

[0018] As Example 1 with the following differences:

[0019] coarse grain mean grain size 280-320 μm

[0020] fine grain mean grain size 30-45 μm

[0021] solvent mixture: ethyl acetate/acetone/ethanol in a ratio of 20%/20%/60%

[0022] pressing pressure with a tool diameter of 50 mm: 1.0 kbars.

[0023] Result:

[0024] Non-initiation ≦36 kbars.

EXAMPLE 3

[0025] octogen mixture with 4% of binder system near the sensitivity limit in accordance with the above-mentioned TL.

[0026] As Example 2 with the following differences:

[0027] coarse grain mean grain size 280-300 μm, crystals <500 μm

[0028] solvent mixture: ethyl acetate/acetone in a ratio of 50%/50%

[0029] tool diameter of 50 mm with a pressing pressure of 0.95 kbars.

[0030] Result:

[0031] Non-initiation ≦26 kbars.

[0032] Example 3.1: Less sensitive, near STANAG 4170.

[0033] octogen mixture with 8% of binder system

[0034] As Example 3 with the following differences:

[0035] pressing pressure 0.65 kbars-0.7 kbars with a tool diameter of 110 mm

[0036] pressing pressure of 0.95 kbars with a tool diameter of 50 mm

[0037] Result:

[0038] Non-initiation ≦46 kbars.

EXAMPLE 4

[0039] hexogen mixture with 8% of binder and RDX-quality B with a distance in relation to the insensitivity limit in accordance with TL

[0040] bimodal grain composition as Example 3

[0041] coarse grains <700 μm

[0042] tool diameter 50 mm required specific pressing pressure <0.95 kbars

[0043] with a tool diameter of 110 mm, specific pressing pressure of 0.65-0.7 kbars.

[0044] Result:

[0045] Non-initiation ≦28 kbars.

[0046] The choice of the bimodal grain size distribution and composition of the solvent for production of the binder lacquer HYTEMP® and DOA, as well as a differing proportion of solvent mixture in the lacquer, result in explosive mixtures which are of differing insensitivity and which in the GAP test reach the classification of little sensitivity in accordance with STANAG 4170 and, with specific pressing

pressures—in dependence on calibre —which are already of 0.6-0.9 kbars, reach more than 98% of the theoretical density.

[0047] Explanation relating to trademarks and abbreviations.

[0048] HYTEMP® registered trademark of ZEON Chemical L. P., 4100 Bells Lane, Louisville, Ky. 40211

[0049] Family of plasticisers*

[0050] * Acycl. dicarboxylic acid ester

[0051] DOA ester of adipic acid such as di-2-ethylhexyladipate

[0052] DIDA diisodecyladipate

[0053] * phthalates

[0054] DOP di-2-ethylhexylphthalate

[0055] DINP di-isononyl

[0056] DIDP diisodecylphthalate

[0057] * polymer plasticisers

1. Pressed insensitive explosive mixtures in which explosive crystals are bound by a binder system, characterised in that a bimodal grain composition comprising coarse-grain and fine-grain explosive crystals is bound by a binder system comprising a plasticiser and HYTEMP®, and is produced in the solvent process.

2. Explosive mixtures according to claim 1 characterised in that the coarse grain has a mean grain size of 280-360 μm with an upper limit of 500-700 μm and the fine grain has a grain size of 15-45 μm.

3. Explosive mixtures according to claim 1 characterised in that the members of the following families can be used as the plasticiser:

* Acycl. dicarboxylic acid ester

DOA ester of adipic acid such as di-2-ethylhexyladipate

DIDA diisodecyladipate

* phthalates

DOP di-2-ethylhexylphthalate

DINP di-isononyl

DIDP diisodecylphthalate

* polymer plasticisers.

4. Explosive mixtures according to claim 1 characterised in that the solvent acetone for the binder system involves 3-10 times the mass of the binder system.

5. Explosive mixtures according to claim 1 characterised in that there is provided a solvent mixture comprising ethyl acetate, acetone and ethanol in the ratio of 20%/20%/60% or ethyl acetate and acetone in the ratio of 50%/50%.

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