

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

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Explosives and related matters: miscellaneous

Transport of PENTAERYTHRITE TETRANITRATE (PETN) with less than 25 % of water but more than 9% of water

Transmitted by the expert from Germany

Introduction

1. This document provides information on sensitivity tests of PETN with different water contents. The tests were done as a reaction to a paper of the expert from Spain informal document INF.8 (47th session) dealing with the transport of PETN with less than 25 % of water but more than 9 % of water.
2. Dry PETN is known to be too sensitive for transport because of its high sensitivity to impact and friction. Explosives with similar and higher sensitivity are generally not suitable for transport.

Test results

3. A Spanish company provided BAM with a sample of PETN with a nominal water content of 12.6 %. Before opening the container it was observed that a significant amount of water had condensed at the wall of the container above the PETN. The actual content of water was determined to be (4.4 ± 0.4) % for a sample taken from the PETN as delivered.
4. For the purpose of comparison a second sample (1.5 g) was weighed with a precision of 0,1 mg and placed in a fume cupboard in a petri dish at room temperature for about 45 min. The loss of weight was then determined to be 3.4 %. Overnight the sample was placed in a desiccator with orange gel. No further loss of weight was observed and so it was placed in an oven at 60 °C for 24 h. An additional loss of 0.09% by mass was observed.
5. After mixing the provided PETN carefully to achieve a uniform distribution of the water a new sample (50 g) of it was placed in a petri dish and left in a fume cupboard over a weekend. The loss of weight was 15.2 %. The content of water was determined for the wet sample to be (17.2 ± 1.9) % as well as for the sample after drying ($<0,1$ %).

6. A sample of the dried PETN was then wetted to 9 % by addition of the calculated amount of water.
7. The sensitivity to friction was determined according to test method 3 (b) (i) with the BAM friction apparatus to be 72 N for the provided PETN after mixing, 54 N for the dried sample and 60 N for 9 % water content.
8. The sensitivity to impact was determined according to test method 3 (a) (ii) with the BAM Fallhammer to be 25 J for the provided PETN after mixing, 4 J for the dried sample and 25 J for 9 % water contents.
9. Test results are additionally summarised in a Table in the Annex.

Conclusions

10. The water in a wetted PETN is only loosely attached to the crystals and can easily be removed even at ambient temperature, as one can expect from a mere (physical) mixture. The less water there is in the beginning, the quicker it will be reduced in case of a leakage.
11. The water in the sample delivered to BAM had a non-uniform distribution with parts of the PETN being much dryer than the nominal value for the water content.
12. The sensitivity to impact and friction was found as expected. The measured values coincide with the values given in literature. Even with about 15.2 % water the PETN has a sensitivity to friction of 72 N and is therefore too sensitive for transport according to test series 3 (limiting value 80 N).
13. The special provision 266 for UN 0150 allows the transport of PETN with less desensitizer than 15 % and with less water than 25 % if the competent authority approves this procedure.

Proposal

14. It is proposed not to change the actual conditions for the transport of PETN. This avoids an undue increase in risk during transport.

Annex**Sensitivity data of wetted PETN as determined in the laboratories of BAM in 2015 for a specific sample.**

<i>Sample</i>	<i>Water content</i>	<i>Friction Sensitivity</i>	<i>Impact Sensitivity</i>
PETN, as delivered, nominal 12.6 % water	15.2 %	72 N	25 J
PETN, dry	< 0.1%	54 N	4 J
PETN, wetted	9 %	60 N	25 J
Limiting values according to UN MTC	-	80 N (see chapter 13.5.1.3.4)	2 J (see chapter 13.4.2.4)
