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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF  
DANGEROUS GOODS AND ON THE GLOBALLY  
HARMONIZED SYSTEM OF CLASSIFICATION  
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the  
Transport of Dangerous Goods

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Sub-Committee of Experts on the Globally  
Harmonized System of Classification  
and Labelling of Chemicals

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Item 2 (a) of the provisional agenda

**ISSUES RELATING TO THE GLOBALLY HARMONIZED SYSTEM OF  
CLASSIFICATION AND LABELLING OF CHEMICALS (GHS)**

Substances having explosive properties and desensitized explosives

Identification of some open issues not yet properly addressed in the GHS

Transmitted by the expert from Germany

**Introduction**

1. One element of the program of work of the Sub-Committee of Experts on the GHS on physical hazards for 2007 to 2008 is to "consider possible solutions to address the classification and labelling of substances having explosive properties and desensitized explosives (in cooperation with the Sub-Committee of Experts on the Transport of Dangerous Goods)" (see ST/SG/AC.10/C.4/24, annex 2, item 2 (a) (ii)). The expert from Germany introduced the issue in documents ST/SG/AC.10/C.3/2005/36; ST/SG/AC.10/C.4/2005/5, ST/SG/AC.10/C.3/2006/27 and ST/SG/AC.10/C.4/2006/5. Once the proposals have been accepted by both Sub-Committees, proposals to amend the screening procedures of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, will be presented accordingly.

## Determination and communication of explosive properties

2. Substances that have shown explosive properties according to the procedure for provisional acceptance in the class of explosives (positive test results in Test Series 1 and 2) might be rejected from the class of explosives depending on the results of the next procedure (assignment to a division according to Test Series 6) with tests on the packaged substance. This approach is correct and applicable as long as the substance remains in the packaged form e.g. for transport and storage but the GHS applies to all sectors and therefore should take account of the intrinsic properties. For example:

Musk Xylene:

- (a) Thermally sensitive (result of Koenen test = 5 mm according to the UN Test Manual, 12 mm according to BAM tests);
- (b) Mechanically sensitive to impact (25 Joule);
- (c) Transport: division 4.1 (only if a “soft” packaging is used);
- (d) GHS: not classified.

3. Other substances might have explosive properties although these are not detected in the provisional acceptance procedure. Examples are substances that are only mechanically sensitive because testing for mechanical sensitivity is not required (such tests are carried out only in order to answer the question whether a substance is too dangerous to be transported at all (unstable explosives) so that the criteria are correspondingly low and these tests are only required if the preceding tests series 1 and 2 are positive).

For example:

- (a) Azodicarbonamide (azobisformamide)
  - (i) Sensitive to shock (BAM Fallhammer)  $\leq 40$  J,
  - (ii) Transport: division 4.1, depending on packaging,
  - (iii) GHS: not classified;
- (b) Di-(2-tert-butylperoxyisopropyl)benzene(s)
  - (i) Sensitive to shock (BAM Fallhammer)  $\leq 40$  J,
  - (ii) Transport: division 5.2, no communication of explosive properties,
  - (iii) GHS: organic peroxide type D, no communication of explosive properties;
- (c) Diphenyloxide-4,4'-disulphonyl hydrazide (OBSH)
  - (i) Sensitive to shock (BAM Fallhammer)  $\leq 40$  J,
  - (ii) Transport: division 4.1, no communication of explosive properties,
  - (iii) GHS: self-reactive type D, no communication of explosive properties.

## Method for determining explosive properties

4. The determination of whether or not a substance has explosive properties could be achieved by adapting the provisional acceptance procedure for the class of explosives. This preliminary test method would be fairly simple because only tests for thermal and mechanical sensitivity would be necessary.

5. The test for thermal sensitivity could be covered by the Koenen test exactly as given in Test Series 2 (limiting diameter 2 mm) so that no additional testing is required if a substance is considered for the class of explosives.

6. Tests for mechanical sensitivity could be covered by the Fallhammer test and the friction test. Both are already part of test series 3 and could be used by adoption of appropriate criteria for this purpose (40 J, 7.5 J and 360 N, 120 N, respectively).

7. If a substance shows positive test results in any of the three tests, it has explosive properties. This knowledge is important and has to be available regardless of the later classification of a substance (which may for example be an organic peroxide or a substance which is not classified at all).

### **Positioning in the GHS**

8. If a method as proposed above is supposed to detect explosive properties of substances regardless of their final classification and regardless of the fact that a substance is considered for the class of explosives it would have to be carried out with all substances with some kind of indication for explosive properties (before the actual classification procedure). Therefore these tests should not be part of the classification procedure of explosives but they should become part of a preliminary procedure (which currently is not described by either the GHS or the UN Manual of Tests and Criteria).

9. In addition, a reference to the screening procedure for substances which may have explosive properties according to the UN Manual of Tests and Criteria, Appendix 6 could be added to the preliminary test method as guidance. There is already a reference to Table A6.1 of Appendix 6 in 2.1.4.2.2 of the GHS which then would not be necessary anymore and could be removed.

### **Communication of explosive properties**

9. The following possibilities exist if substances show explosive properties either in the thermal sensitivity test or in one of the mechanical stimuli tests (impact or friction):

- (a) The substances have other hazardous properties and are classified accordingly (e.g. as organic peroxide, self-reactive substance or substances currently assigned to transport Classes 4, 5.1 or 8). These substances need additional communication of the explosive properties. (For organic peroxides and self-reactive substances (type A and B) this is already regulated in Annex 2, sections A2.8 and A2.15 of the GHS. However, this is based on the results of heating under confinement only and not on the mechanical sensitivity. For the other substances there is no such regulation at all.)
- (b) The substances do not have other hazardous properties and as a result are currently not classified by the normal classification procedure. For transport these substances are currently classified by listing as a “grandfather clause” or

they are not classified at all. This is a non-satisfactory situation as it may lead to different classification of such substances and preparations between TDG and GHS. This should be clarified and the risk of non sufficient hazard communication should be avoided.

10. Therefore the explosive properties of a substance that has shown to have explosive properties in the preliminary test method should be communicated unless they are communicated anyway as a result of the normal classification of the substance.

## **Proposal**

11. Add the following new chapter for preliminary tests (this might later also be helpful e.g. for chemically unstable gases). Since this new chapter contains preliminary tests it should be positioned right at the beginning of Part 2 on the physical hazards (e.g. as chapter 2.0 of the GHS).

### **“2.0 Preliminary tests for explosive properties**

#### **2.0.1 General considerations**

The aim of these preliminary tests is not to determine whether a substance will be classified as an explosive but to determine whether a substance has explosive properties. If a substance has explosive properties these require appropriate hazard communication regardless of the later classification of the substance which may be such that the explosive properties would normally not be communicated. A screening procedure for explosive properties is given in Appendix 6 of the *UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria*.

#### **2.0.2 Criteria**

Preliminary tests for explosive properties have to be carried out with all substances which are suspected to have explosive properties. These may for example be organic peroxides, self-reactive substances or substances according to table A 6.1 of the UN Tests Manual.

The preliminary tests consist of the following test procedures:

- (a) Test for thermal sensitivity (sensitivity to heating under confinement, Koenen test):  
Procedure: As described in the UN Manual of Test and Criteria, Chapter 12.5.1,  
Criteria: Limiting diameter  $\geq 2$  mm and/or  $\geq 6$  mm;
- (b) Test for mechanical sensitivity to impact (BAM Fallhammer test):  
Procedure: As described in the UN Manual of tests and Criteria,

Chapter 13.4,

Criteria: Limiting impact energy  $\leq 40$  J and/or  $\leq 7.5$  J;

- (c) Test for mechanical sensitivity to friction (BAM friction test):  
 Procedure: As described in the UN Manual of tests and Criteria,  
 Chapter 13.5,  
 Criteria: Limiting friction energy  $\leq 360$  N and/or  $\leq 120$  J.

### 2.0.3 Hazard communication

Substances which have explosive properties have to be labelled as follows:

		<b>Thermally sensitive</b>	<b>Mechanically sensitive</b>
Required only if reference to the explosive properties is not made due to the classification anyway	<b>GHS Symbol</b>	-	
	<b>Signal word</b>	Danger	
	<b>Hazard statement</b>	May explode under confinement	
Required hazard communication	<b>Safety Data Sheet</b>	Thermal sensitivity must be communicated in the SDS	Mechanical sensitivity must be communicated in the SDS e.g.: "Very sensitive to impact and/or friction" if limiting impact energy $\leq 7.5$ J or if limiting friction energy $\leq 120$ J "Sensitive to impact and/or friction" if limiting impact energy $\leq 40$ J or if limiting friction energy $\leq 360$ J

*Note: If a substance is thermally and mechanically sensitive, the hazard communication elements for both are required (meaning the SDS has to indicate the mechanical sensitivity in addition to the other information which is required for thermally sensitive substances).".*