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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

Forty-first session
Geneva, 25 June – 4 July 2012
Item 2 (b) of the provisional agenda
Explosives and related matters:
Screening test for substances that may have explosive properties

Changes to screening test for substances that may have explosive properties

Transmitted by the expert from Japan and by the International Council of Chemical Associations (ICCA)[1]

Background

1. At the thirty-eight session the expert from Japan and ICCA jointly proposed to discuss exclusion of adiabatic calorimetry from the screening procedure described in subsection 20.3.3.3 of the Manual of Tests and Criteria, where both adiabatic calorimetry and differential scanning calorimetry (DSC) are allowed to be used to measure the exothermic decomposition energy for the substances that may have explosive properties (ST/SG/AC.10/C.3/2010/60).

2. The intention of this proposal was to improve the reliability of the screening test by standardizing the exothermic decomposition energy measurement.

3. The proposal was accepted and this issue was discussed with further rationale at the thirty-ninth session after being reviewed by experts at the IGUS-EOS meeting (Washington DC, April, 2011) where no counterargument was presented against limiting the calorimetric method to DSC.

[1] In accordance with the programme of work of the Sub-Committee for 2011-2012 approved by the Committee at its fifth session (refer to ST/SG/AC.10/C.3/76, para. 116 and ST/SG/AC.10/38, para. 16).

4. At the thirty-ninth session, some experts expressed difficulty in limiting the calorimetric method to DSC. However, there was wide support for the proposal and a formal proposal for the forty-first session was anticipated (see ST/SG/AC.10/C.3/78, para. 20).

Discussion

5. This proposal to amend 20.3.3.3 of the Manual of Tests and Criteria has no intention to affect the choice of suitable calorimetric technique to evaluate thermal stability of substances such as determining SADT (Self Accelerating Decomposition Temperature). It only refers to suitable calorimetric technique to estimate exothermic decomposition energies of substances.

6. As described in ST/SG/AC.10/C.3/2010/60, it was experimentally observed that there were considerable disagreements between two exothermic decomposition energies of the very same samples; Q_{DSC} and Q_{adia}, measured by DSC and adiabatic calorimetry, respectively.

7. For the above reason, it is considered that allowing two different methods based on different principles to coexist on an equal basis makes it difficult to accomplish standardization of the exothermic decomposition energy measurement that is essential to improve the reliability of the screening test for substances that may have explosive properties.

8. In informal document INF.21 (thirty-ninth session), it was demonstrated that DSC has the advantage over adiabatic calorimetry in the measurement of the exothermic decomposition energy due to DSC's approach in which heat loss and heat capacity are implicitly accounted for.

9. Therefore, we consider that subsection 20.3.3.3 should be amended to indicate that DSC is a recommended method to measure exothermic decomposition energies of substances.

Proposal

10. In 20.3.3.3 of the Manual of Tests and Criteria, it is proposed to amend the first sentence and add a new sentence after the first sentence as follows:

> "20.3.3.3 Thermal stability ~~and exothermic decomposition energy~~ may be estimated using a suitable calorimetric technique such as differential scanning calorimetry or adiabatic calorimetry. For estimating exothermic decomposition energy, a suitable calorimetric technique such as differential scanning calorimetry may be used. In using…."