Self-reactive substances and mixtures (4): Classification

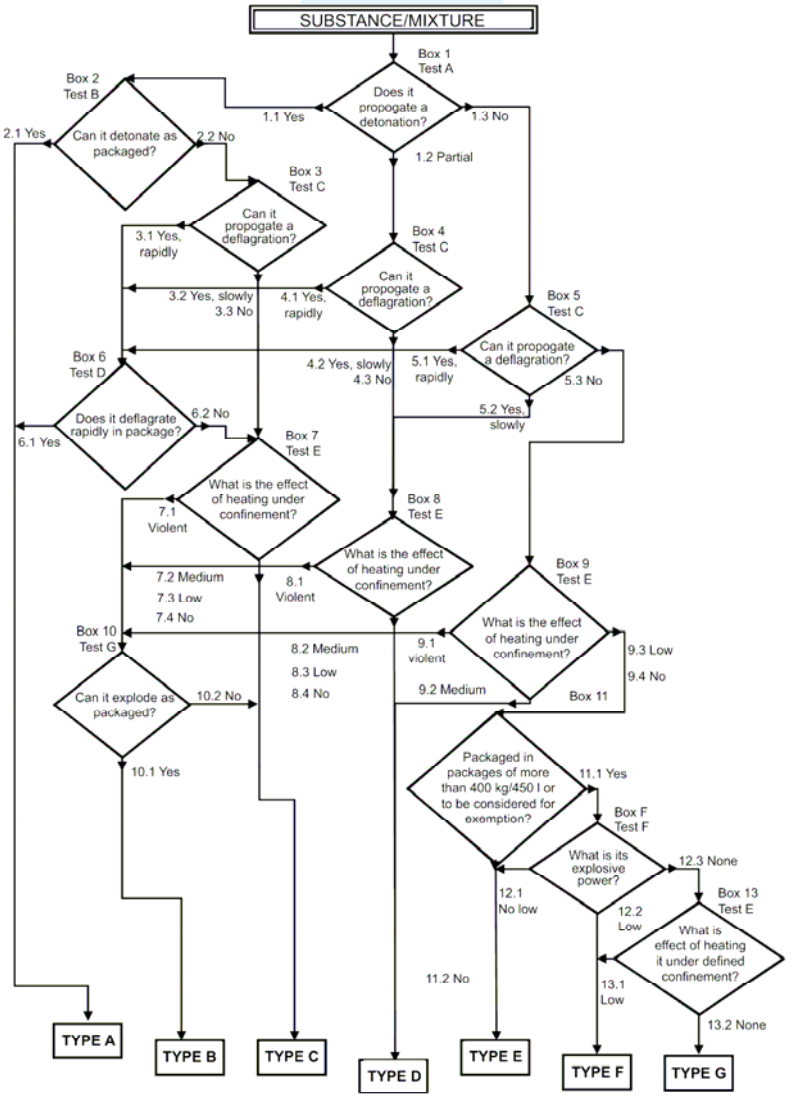
- Decomposition energy > 300 kJ/kg from DSC measurement
- SADT < 75 °C

- Self-reactive substance acc. to GHS Directive
- Self-reactive substance acc. to transport regulations (Class 4.1)

- Further classification following extensive testing
- For transport, approval by „Competent Authorities“
- In general, only small packagings (≤ 50 kg net mass)

Organic peroxides and self-reactive substances and mixtures (5)

Further testing is extensive and follows the flowchart of the UN !



Explosives (1): Screening procedure

- Explosive properties are associated with the presence of certain chemical groups in a molecule… .
- The screening procedure is aimed at identifying the presence of such reactive groups and the potential for rapid energy release.
- If the screening procedure identifies the substance or mixture to be a potential explosive, the acceptance procedure … has to be performed.

Explosives (2): Criteria for exclusion

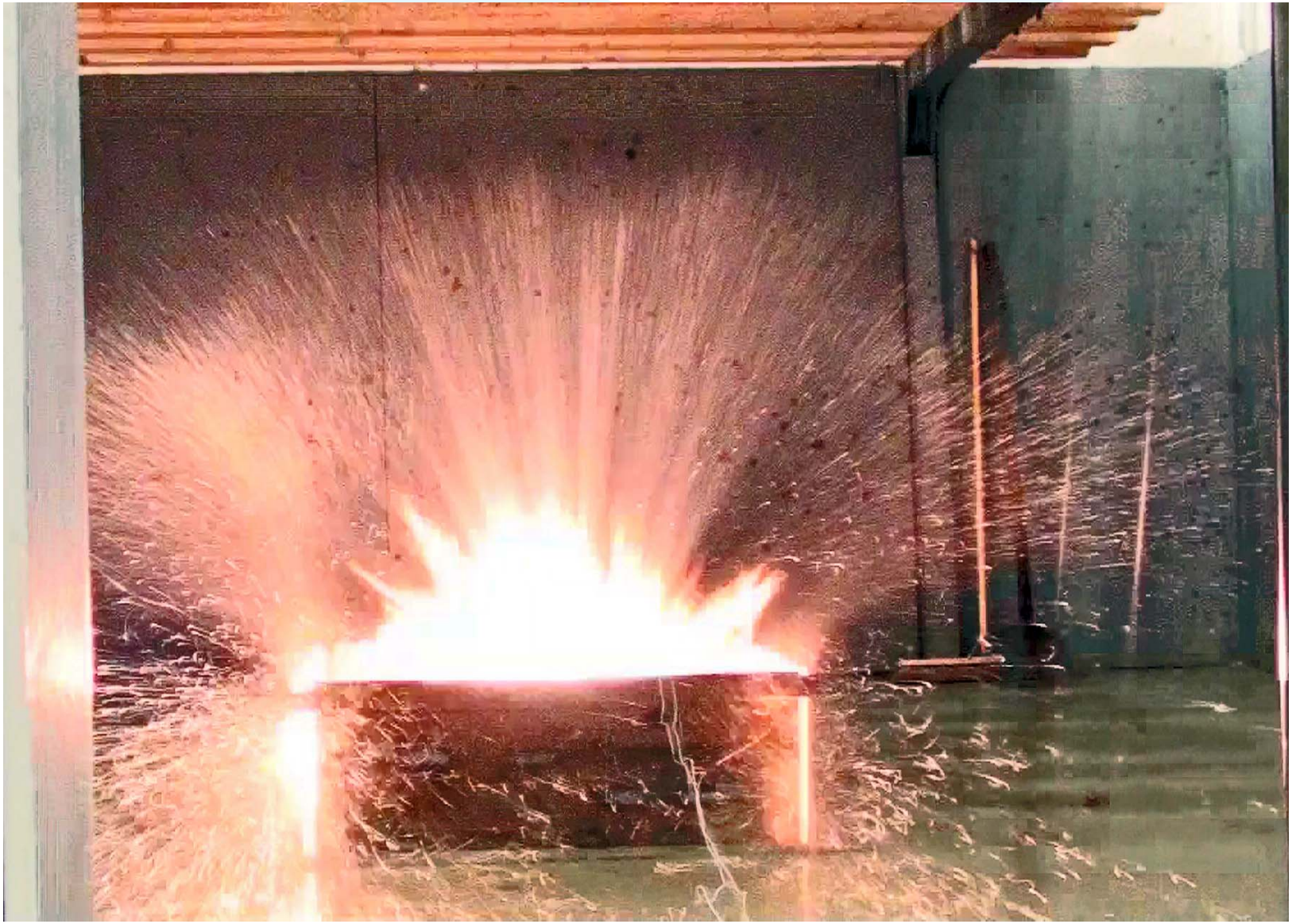
A substance / mixture shall not be classified as explosive if

- (a) There are no chemical groups associated with explosive properties present in the molecule(see Table 6.1, Annex 6, *UN Manual of Tests and Criteria)*; or
- (b) The substance contains chemical groups associated with explosive properties which include oxygen and the calculated oxygen balance is less than - 200;
- (c) When … the exothermic decomposition energy is less than 500 J/g and the onset of exothermic decomposition is below 500 °C; or
- …

Explosives (3): Comparison DSD vs. GHS

DSD Test method: EC A.14	GHS Test method: UN Test series 2
Impact sensitivity 50 mg	Sensitivity to detonative shock 2 kg !
Friction sensitivity about 500 mg	Ignition under confinement about 15 g
Heating under confinement (Koenen test) about 30 g	Heating under confinement (Koenen test) about 30 g followed by further extensive testing

Explosives (4): Sensitivity to detonative shock

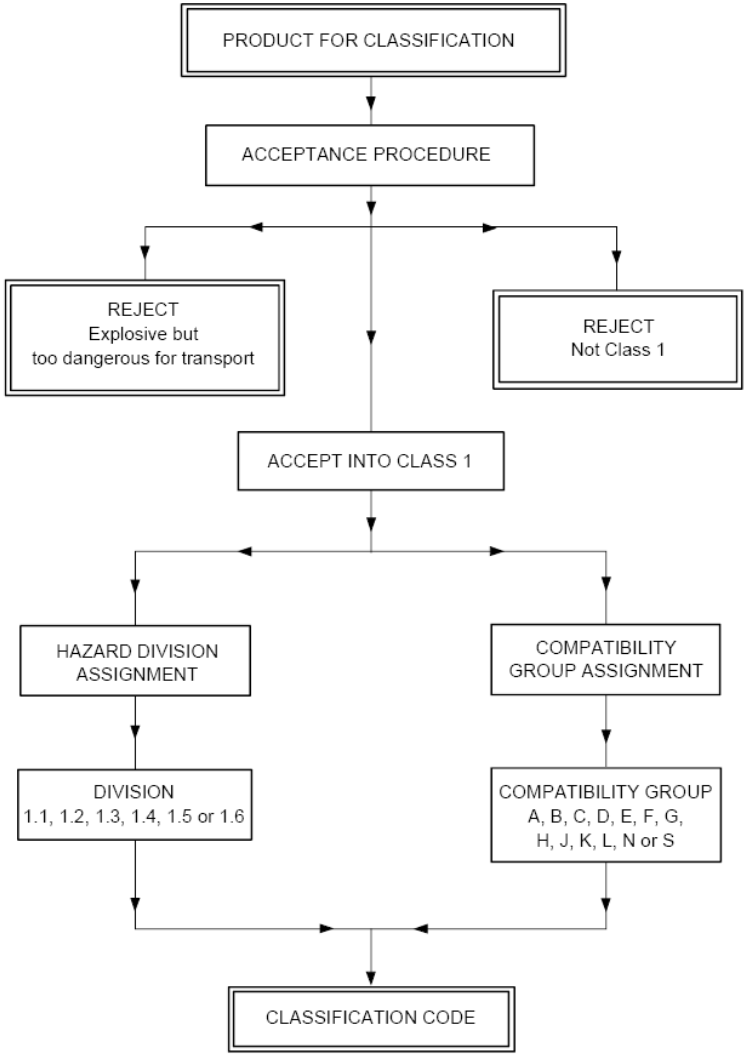


Explosives (5): Classification scheme

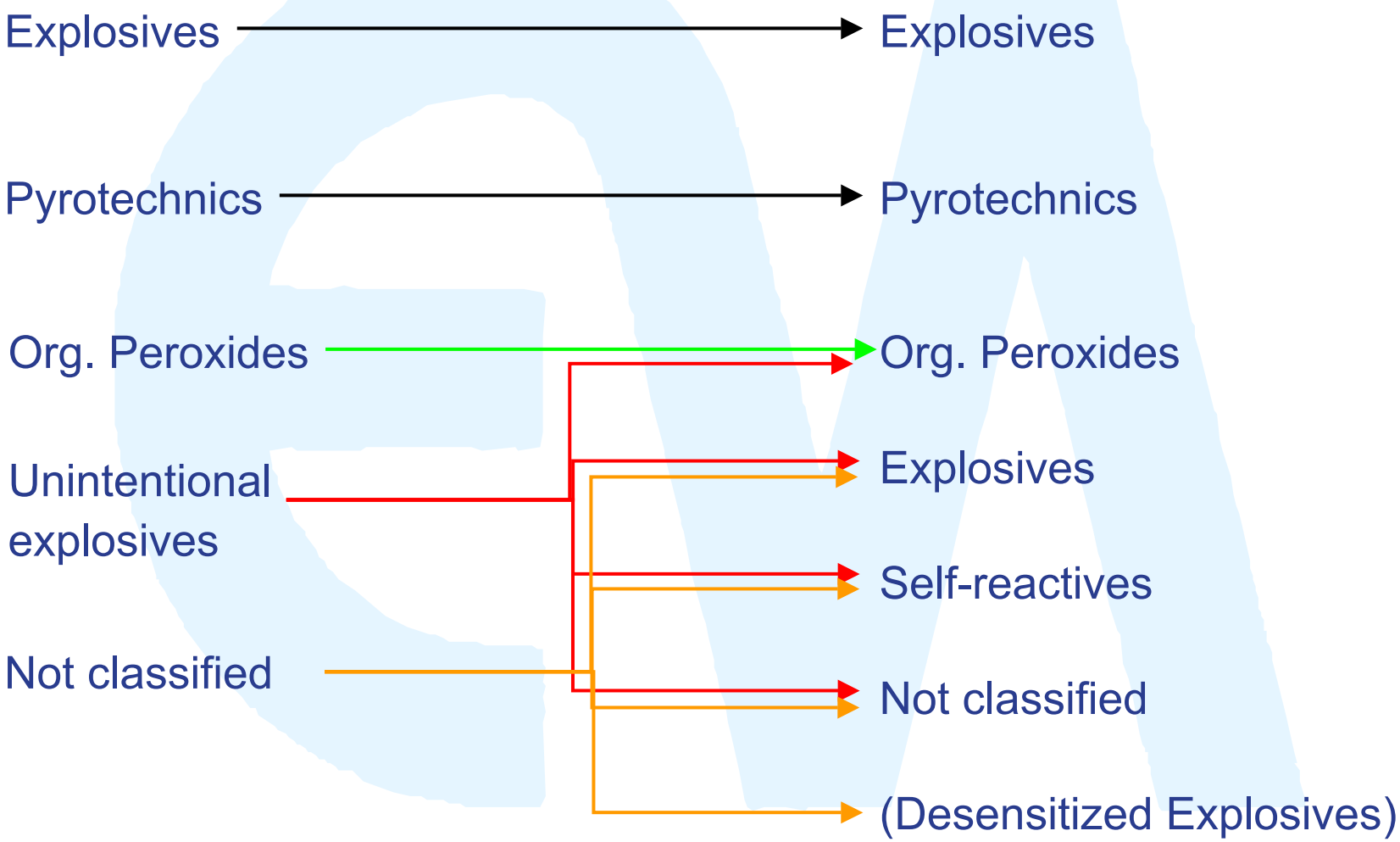
Classification is a complex procedure:

In the acceptance procedure, a classification as „Explosive“ is established.

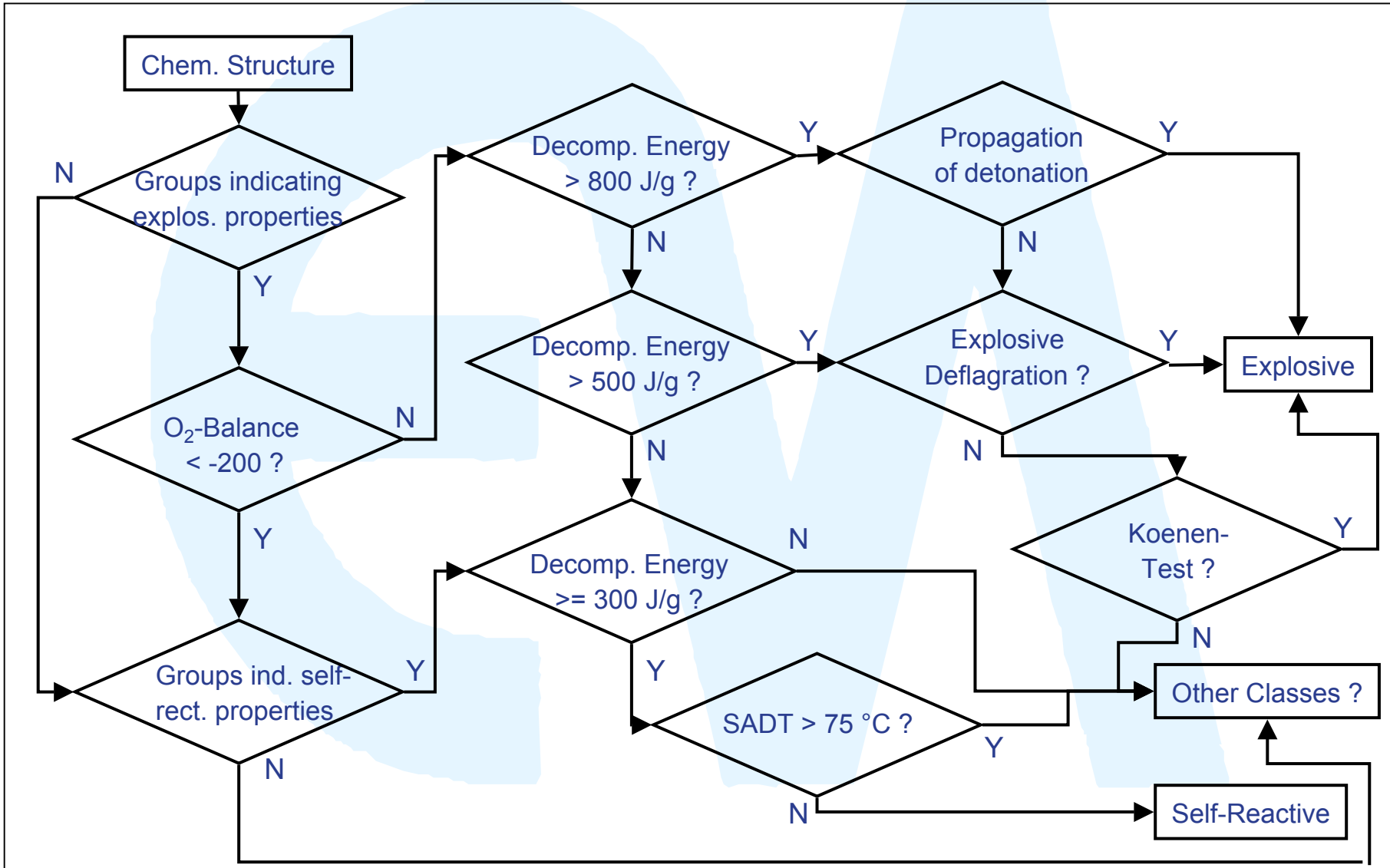
In a second step, the division and compatibitly group are determined.



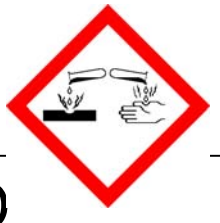
Energetic substances and mixtures



Testing of energetic substances and mixtures (simplified)



Corrosive to metals



- New hazard class without correspondance in DSD
- Test method: UN C.1
- Criteria for classification: Corrosion rate on either steel or aluminium surfaces exceeding 6,25 mm per year at a test temperature of 55 °C

Classification	Category 1
GHS Pictogram	
Signal Word	Warning
Hazard Statement	H290: May be corrosive to metals

Conclusions

- For new substances, apply the UN criteria already now
- Check carefully if you can really apply the translation table of Annex VII
- Obtain help from a competent (!) expert
- Take possible consequences in downstream legislation into account
- Be aware of the minimum requirements of REACH
- Check whether the new hazard classes have to be applied to yo substances
- Careful checking is especially required for energetic substances mixtures; a DSC measurement may help you in identifying a nee to act

Requirements for DSC measurements

- Representative sample
- Closed crucible
- Inert crucible material
- Sample preparation under inert conditions if required
- Heating rate: 3 – 5 K/min

Computer tools for the translation of hazards

Computers assist you in producing more reliable and more precise errors

See http://www.dohrendorf.de/pages/startseite/berufsleben/vom-teen-ager-zum-man-ager.php

Thank you for your attention !

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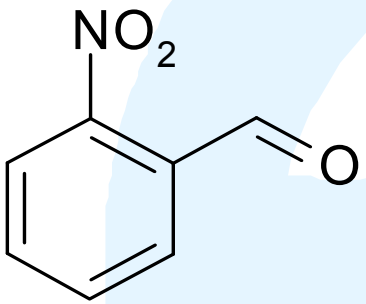
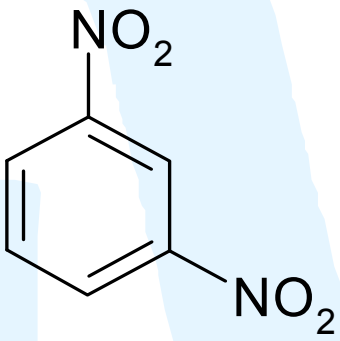
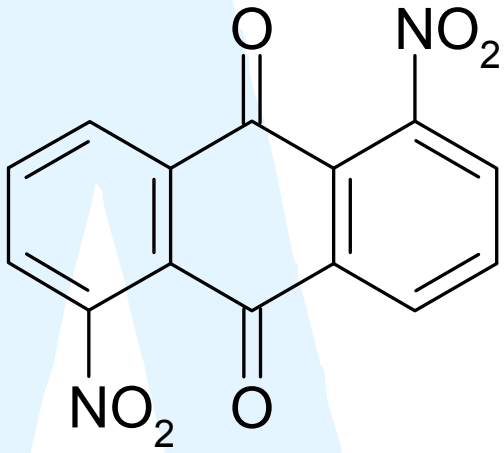
Explosives (7): Prediction of properties



No propagation
of detonation



No propagation
of detonation



Propagation
of detonation

Germany:
Classified as explosive