



**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****Fifty-seventh session**

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Item 3 of the provisional agenda

Listing, classification and packing**Toxicity of UN 2248, 2264 and 2357****Submitted by the expert from the Republic of Korea*****Revision****Introduction**

1. At the fifty-seventh session of the Sub-Committee, the Republic of Korea brought forward proposals on the toxicity of UN 2248, 2264 and 2357 (ST/SG/AC.10/C.3/2020/7). This document is based on the background laid out in ST/SG/AC.10/C.3/2020/7. The Republic of Korea welcomed that many experts gave support on the document during the online informal discussions. Along with the support, many experts also pointed out that the necessity of a transitional period in the sense that some changes could have a serious burden on industry. This is considered in the new proposals as follows.

Proposal 1: amendments to UN 2248**Rationale**

2. Based on the data provided (for details, refer to Annex I), UN 2248 has an oral toxicity (LD₅₀) of 220 mg/kg and a dermal toxicity (LD₅₀) of 768 mg/kg.

3. The inhalation toxicity value for vapours is 218 ppm (4h exposure). The Model Regulations specifies that LC₅₀ values should be based on 1h exposure. Therefore, this value should be converted to 436 ppm on 1h exposure by multiplying the LC₅₀ (4h value) by 2 for vapours (see 2.6.2.2.4.5 of the Model Regulations). Since the value refers to inhalation toxicity for vapours, the packing group should be calculated with the saturated vapour concentration (hereafter SVC) in accordance with 2.6.2.2.4.3 of the Model Regulations. The SVC was calculated using the equation included in the report from the National Institute for

* 2020 (A/74/6 (Sect.20) and Supplementary, Subprogramme 2.)

Public Health and the Environment of the Netherlands (RIVM) circulated as informal document INF.8 for the thirty-third session of the Sub-Committee¹:

$$SVC \text{ (ml/m}^3\text{)} = VP/(R \times T) \times v_m \times 1000$$

Where: VP is the vapour pressure at 20 °C (Pa)

R is the gas constant (8.314 m³ Pa/K mole)

T is the temperature (at 293 K, equals 20 °C)

v_m is the molar volume of ideal gas (24.1 l/mol at 20 °C)

1000 is the conversion factor between ml and l (1000 ml/l)

4. The vapour pressure of the Di-n-butylamine was confirmed as 0.27 kPa (= 270 Pa) at 20 °C. This value was taken from the ILO International Chemical Safety Cards (<https://pubchem.ncbi.nlm.nih.gov/compound/8148#section=Vapor-Pressure>).
5. According to the results of the calculation, the SVC of the Di-n-butylamine is 2671 ml/m³.
6. In conclusion, the LC₅₀ of UN 2248 is 436 ppm for 1h exposure as mentioned above, with the units ml/m³ deemed to be equivalent to ppm.
7. The Model Regulations stipulate in paragraph 2.6.2.2.4.3 (b), that liquids having toxic vapours shall be assigned to packing group II if $SVC \geq LC_{50}$ and $LC_{50} \leq 3000 \text{ ml/m}^3$ and not meeting the criteria for packing group I in 2.6.2.2.4.3 (a).
8. Although only acute oral and dermal toxicity were considered to evaluate the toxicity by comparison with the GESAMP hazard profiles in the early stage of the amendment, the inhalation toxicity should be considered in the proposal for proper classification of UN 2248.
9. Therefore, UN 2248 should be classified in Division 6.1, packing group II.
10. Accordingly, the primary hazard of UN 2248 should be changed to division 6.1 and class 8 should be added as a subsidiary hazard in accordance with the table of precedence of hazards in 2.0.3.3 of the Model Regulations.
11. Also, the limited (LQ) and exempted quantities (EQ) codes and the tank instructions should be revised in accordance with the Guiding Principles, following the revision of the major hazard. There is no need to change any other transport conditions such as the packing instructions.
12. In the course of the review, it was noticed that there is a mistake in the initial proposal for the amendment to UN 2248 on Tank Instructions. As pointed out by several experts, T7 should remain as T20 is only applicable to PG I substances. Furthermore, the transitional period for this amendment is not necessary as there is no change in tank instructions.
13. Notwithstanding the comment from the expert of Germany, the Republic of Korea would like to focus on the toxicity of Di-n-butylamine. Bearing in mind that the change of transport condition could have a large impact on the stakeholders unintentionally, the amendment of the classification of certain substance must be considered carefully. Based on that reasoning, only toxicity data have considered in this document except for the reassessment of the change of corrosivity to PG I. Other delegations who have an interest in amending the corrosivity of Di-n-butylamine are kindly invited to consider additional review of the proposals for a better classification of UN 2248 based on the corrosivity studies, if needed.

¹ <http://www.unece.org/fileadmin/DAM/trans/doc/2008/ac10c3/UN-SCETDG-33-INF08e.pdf>.

Proposal

14. Amend the entry for UN 2248 in the Dangerous Goods list as follows (new text is shown in **red, bold, underlined**, deleted text is marked as strikethrough):

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provisions	Limited and excepted quantities		Packagings and IBCs		Portable tanks and bulk containers	
						(7a)	(7b)	Packing instruction	Special packing provisions	Instructions	Special provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
2248	DI-n-BUTYLAMINE	8 <u>6.1</u>	3 <u>8</u>	II	-	4L <u>100 ml</u>	E2 <u>E4</u>	P001 IBC02	-	T7	TP2 <u>TP13</u>

Proposal 2: amendments to UN 2264

Rationale

15. Based on the data provided (for details, refer to Annex II), the toxicity of UN 2264 is determined by an oral toxicity (LD₅₀) of 272 mg/kg and an acute dermal toxicity (LD₅₀) of 380 mg/kg.

16. Therefore, according to the 2.6.2.2.4.1 of the Model Regulations, UN 2264 should be classified in Division 6.1, packing group III.

17. The primary hazard of UN 2264 should remain as class 8 and division 6.1 should be added as subsidiary hazard according to the table of precedence of hazards in 2.0.3.3 of the Model Regulations.

18. There is no need to change any other transport conditions such as the packing instructions, or the limited (LQ) or exempted quantities (EQ), as we confirmed.

19. The inhalation toxicity value for vapours is between 1.7 – 5.8 mg/l (320 ppm to 1120 ppm) for 6h exposures. There is no method in the Model Regulations to use 6h exposure for a 1h exposure limit. If we could arbitrarily apply the conversion method for vapours by analogy to the 4h exposure conversion method, of 2 multiplied by 3 to the 6h exposure, this data could be converted to 5.1 – 17.4 mg/l related to 1h exposure. But the range of this value is too broad and taking into account that, as mentioned above, there is no stipulated method for converting the value for 6h exposure to a 1h exposure, the inhalation toxicity of UN 2264 has not been taken into account in the proposal.

Proposal

20. Amend the entry for UN 2264 in the list of dangerous goods as follows (new text is shown in **red, bold, underlined**):

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provision	Limited and excepted quantities		Packagings and IBCs		Portable tanks and bulk containers	
						(7a)	(7b)	Packing instruction	Special packing provisions	Instructions	Special provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
2264	N,N-DIMETHYL-CYCLOHEXYLAMINE	8	3 <u>6.1</u>	II	-	1L	E2	P001 IBC02	-	T7	TP2

Proposal 3. amendments to UN 2357

Rationale

21. Based on the data provided (for details, please refer to Annex III), UN 2357 has an oral toxicity (LD₅₀) of 156 mg/kg and an acute dermal toxicity (LD₅₀) of 631-1000 mg/kg.

22. Therefore, according to 2.6.2.2.4.1 of the Model Regulations, UN 2357 should be classified in Division 6.1, packing group III.

23. On the comment of the expert from Germany during the online informal discussions, it is noted that this substance is classified as skin corrosion 1B in the GHS. The primary hazard of UN 2357 should still remain as class 8, and division 6.1 should be added as a subsidiary hazard according to the table of precedence of hazards in 2.0.3.3 of the Model Regulations.

24. There is no need to change any other transport conditions such as the packing instructions, the limited (LQ) or exempted quantities (EQ).

25. Notwithstanding the comment of the expert from Germany, the Republic of Korea would like to focus on the toxicity of Cyclohexylamine. Bearing in mind that the change of transport condition could have a large impact on the stakeholders unintentionally, the amendment of the classification of certain substance must be considered carefully. Based on that reasoning, only toxicity data have been considered in this document except for the reassessment of the change of corrosivity to PG I. Other delegations who have an interest in amending the corrosivity of cyclohexylamine are invited to consider additional review of the proposal for a better classification of UN 2357 based on the corrosivity studies, if needed.

Proposal

26. Amend the entry for UN 2357 in the Dangerous Goods List as follows (new text is shown in **red, bold, underlined**):

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provision	Limited and excepted quantities		Packagings and IBCs		Portable tanks and bulk containers	
								Packing instruction	Special packing provisions	Instructions	Special provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
2357	CYCLOHEXYLAMINE	8	3 <u>6.1</u>	II	-	1L	E2	P001 IBC02	-	T7	TP2

Annex I

[English only]

Data sheet for Di-n-butylamine (UN 2248)²

Section 1. SUBSTANCE IDENTITY

- 1.1 Chemical name**Di-n-butylamine**
- 1.2 Chemical formula**C8H19N**
- 1.3 Other names/synonyms**dibutylamine**
- 1.4.1 UN Number**2248** 1.4.2 CAS Number**111-92-2**
- 1.5 Proposed classification for the Recommendations
- 1.5.1 proper shipping name (3.1.2³).....**DI-n-BUTYLAMINE**
- 1.5.2 class/division**8** subsidiary hazard**3**
- Packing group**II**
- 1.5.3 proposed special provisions, if anynot applicable
- 1.5.4 proposed packing instruction(s)not applicable

Section 2. PHYSICAL PROPERTIES ^a

- 2.1 Melting point or range**-62.0 °C**
- 2.2 Boiling point or range**159.6 °C**
- 2.3 Relative density at:
- 2.3.1 15 °C no data
- 2.3.2 20 °C **0.7601 at 20 °C**
- 2.3.3 50 °C no data

² References:

- ^a EPA DSSTox (<https://comptox.epa.gov/dashboard/DTXSID7024952>) / Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 438 / ILO International Chemical Safety Cards (ICSC) (https://www.ilo.org/dyn/icsc/showcard.display?p_version=2&p_card_id=1337) / J. Phys. Chem.; EN; 85; 17; 2520-2524.; cited in Beilstein, registry No. 506001, 25 Oct 2006 / Chem Inspect Test Inst; Biodegradation and Bioaccumulation Data of Existing Chemicals Based on the CSCL Japan; Published by Japan Chemical Industry Ecology-Toxicology & Information Center. ISBN 4-89074-101-1 (1992) /
- ^b National Toxicology Program, Institute of Environmental Health Sciences, National Institutes of Health (NTP). 1992. National Toxicology Program Chemical Repository Database. Research Triangle Park, North Carolina / European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/4/13/?documentUUID=d35931c7-f822-476f-a269-a8b93a5af0a2>)
- ^c Lewis, R.J., 1996, Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, p. 1069
- ^d European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/7/3/4>)
- ^e European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/7/3/3>)
- ^f European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/7/4/2>)
- ^g European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/2/1>)
- ^h Calamari, D., et al., 1980, Estimating the hazard of eight amines on aquatic life. Chemosphere 9, 753
- ⁱ European Chemical Agency (ECHA), Dibutylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13527/6/2/4>)

³ This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods

- 2.4 Vapour pressure at:
- 2.4.1 20 °C **0.27** kPa
- 2.4.2 65 °C no data
- 2.5 Viscosity at 20 °C**0.85** mPa s
- 2.6 Solubility in water at 20 °C**3500** mg/l
- 2.7 Physical state at 20 °C (2.2.1.1) **liquid**
- 2.8 Appearance at normal transport temperatures, including colour and odourno data
- 2.9 Other relevant physical propertiesno data

Section 3. FLAMMABILITY ^b

- 3.1 Flammable vapour
- 3.1.1 Flash point (2.3.3)**125** °F
- 3.1.2 Is combustion sustained? (2.3.1.3) **yes**
- 3.2 Autoignition temperature **255** °C
- 3.3 Flammability range (LEL/UEL)no data %
- 3.4 Is the substance a flammable solid? (2.4.2) no

Section 4. CHEMICAL PROPERTIES

- 4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity? no
- 4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.1) no
- 4.3 Is the substance a desensitized explosive? (2.4.2.4) no
- 4.4 Is the substance a self-reactive substance? (2.4.1) no
- 4.5 Is the substance pyrophoric? (2.4.3) no
- 4.6 Is the substance liable to self-heating? (2.4.3) no
- 4.7 Is the substance an organic peroxide? (2.5.1) no
- 4.8 Does the substance in contact with water emit flammable gases? (2.4.4) no
- 4.9 Does the substance have oxidizing properties? (2.5.1) no
- 4.10 Corrosivity (2.8) to:
- 4.10.1 mild steelno data
- 4.10.2 aluminium no data
- 4.10.3 other packaging materials (specify)
..... No data
- 4.11 Other relevant chemical propertiesno data

Section 5. HARMFUL BIOLOGICAL EFFECTS

- 5.1 LD₅₀, oral (2.6.2.1.1)**220** mg/kg^c Animal species**Rat**
- 5.2 LD₅₀, dermal (2.6.2.1.2) **768** mg/kg^d Animal species**Rabbit**
- 5.3 LC₅₀, inhalation (2.6.2.1.3) **1.15** mg/l^e Exposure time.....**4 hours**
or ...**218** ml/m³ Animal species**Rat**
- 5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3)**2670** ml/m³
- 5.5 Skin exposure (2.8) results: **Corrosive^f** Exposure time...**3 minutes and 1 hour**
Animal species..... **Rabbit**

5.6 Other data^g

Corrosive, severe skin and eye irritant, reproductive toxicity, germ cell mutagenicity and specific target organ toxicity (single exposure)

Ecological toxicity

Fish (*Salmo gairdneri*), LC₅₀ (96h): 37mg/L^h

Aquatic invertebrates (*Daphnia magna*), EC₅₀ (48h): 65.98mg/Lⁱ

5.7 Human experience.....**not applicable**

Annex II

[English only]

Data sheet for N, N-Dimethyl cyclohexylamine (UN 2264)⁴

Section 1. SUBSTANCE IDENTITY

- 1.1 Chemical name **N,N-Dimethyl cyclohexylamine**
- 1.2 Chemical formula **C₈H₁₇N**
- 1.3 Other names/synonyms **cyclohexyldimethylamine, dimethylaminocyclohexane**
- 1.4.1 UN Number **2264** 1.4.2 CAS Number **98-94-2**
- 1.5 Proposed classification for the Recommendations
- 1.5.1 proper shipping name (3.1.2⁵)..... **N,N-DIMETHYL-CYCLOHEXYLAMINE**
- 1.5.2 class/division **8** subsidiary hazard **3**
- Packing group **II**
- 1.5.3 proposed special provisions, if anynot applicable
- 1.5.4 proposed packing instruction(s)not applicable

Section 2. PHYSICAL PROPERTIES ^a

- 2.1 Melting point or range **-77 °C**
- 2.2 Boiling point or range **160 °C**
- 2.3 Relative density at:
- 2.3.1 15 °C no data
- 2.3.2 20 °C **0.8490**
- 2.3.3 50 °C no data

⁴ References:

^a Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand Reinhold Co., 1977., p. 306 / EPA DSSTox(<https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID9026633#properties>) / ILO International Chemical Safety Cards (ICSC)(https://www.ilo.org/dyn/icsc/showcard.display?p_version=2&p_card_id=1444) / European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier(<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/4/23/?documentUUID=7d795eb9-658d-4288-81f4-348cb39ee7a5>)

^b Hawley, G.G. The Condensed Chemical Dictionary. 9th ed. New York: Van Nostrand Reinhold Co., 1977., p. 306 /European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier(<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/4/13/?documentUUID=7906eeee-5938-4cda-a5db-174cbf039d3c>) /

^c European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/7/3/2>)

^d European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/7/3/4>)

^e European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/7/3/3>)

^f European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/7/4/2/?documentUUID=00a77466-5f8a-48a9-908c-39fb2a6053a5>)

^g European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/2/1>)

^h European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/6/2/2>)

ⁱ European Chemical Agency (ECHA), Cyclohexyldimethylamine - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13521/6/2/6>)

⁵ This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods

- 5.5 Skin exposure (2.8) results: **Corrosive^f** Exposure time.....**No data**
Animal species.....**Rabbit**
- 5.6 Other data^g
Corrosive, severe skin and eye irritant, reproductive toxicity, germ cell mutagenicity, carcinogenicity and specific target organ toxicity (single and repeated exposure)
Ecological toxicity
Fish (*Oncorhynchus mykiss*), LC₅₀ (96h): 28mg/L^h
Aquatic plants (*Scenedesmus subspicatus*), EC₅₀ (72h): 0.79mg/Lⁱ
- 5.7 Human experience.....Not applicable

Annex III

[English only]

Data sheet for Cyclohexylamine (UN 2357)⁷

Section 1. SUBSTANCE IDENTITY

- 1.1 Chemical name **Cyclohexylamine**
- 1.2 Chemical formula **C₆H₁₃N**
- 1.3 Other names/synonyms **aminocyclohexane**
- 1.4.1 UN Number **2357** 1.4.2 CAS Number **108-91-8**
- 1.5 Proposed classification for the Recommendations
- 1.5.1 proper shipping name (3.1.2⁸)..... **CYCLOHEXYLAMINE**
- 1.5.2 class/division **8** subsidiary hazard **3**
- Packing group ... **II**
- 1.5.3 proposed special provisions, if any not applicable
- 1.5.4 proposed packing instruction(s) not applicable

Section 2. PHYSICAL PROPERTIES ^a

- 2.1 Melting point or range **-17.7 °C**
- 2.2 Boiling point or range **134.5 °C** at 760mmHg
- 2.3 Relative density at:
- 2.3.1 15 °C no data
- 2.3.2 20 °C **0.8647**
- 2.3.3 50 °C no data
- 2.4 Vapour pressure at:
- 2.4.1 20 °C **1.4 kPa**
- 2.4.2 65 °C no data
- 2.5 Viscosity at 20 °C **2.10 Pa*s**

⁷ References:

- ^a EPA DSSTox(<https://comptox.epa.gov/dashboard/DTXSID1023996>) / Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 460 / ILO International Chemical Safety Cards (ICSC)(https://www.ilo.org/dyn/icsc/showcard.display?p_version=2&p_card_id=0245)
- ^b ILO International Chemical Safety Cards (ICSC) (https://www.ilo.org/dyn/icsc/showcard.display?p_version=2&p_card_id=0245) /
- ^c Lewis, R.J., 1996, Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, p. 960
- ^d European Chemical Agency (ECHA), CYCLOHEXYLAMINE - Registration Dossier (<https://echa.europa.eu/registration-dossier/-/registered-dossier/13348/7/3/4/?documentUUID=c8cc6b67-5607-45e4-87d3-1dc01649f75e>)
- ^e European Chemical Agency (ECHA), CYCLOHEXYLAMINE - Registration Dossier (<https://echa.europa.eu/de/registration-dossier/-/registered-dossier/13348/7/4/2/?documentUUID=d516cd27-1283-4151-9832-18a05a74b703>)
- ^f European Chemical Agency (ECHA), CYCLOHEXYLAMINE - Registration Dossier (<https://echa.europa.eu/de/registration-dossier/-/registered-dossier/13348/2/1>)
- ^g European Chemical Agency (ECHA), CYCLOHEXYLAMINE - Registration Dossier (<https://echa.europa.eu/de/registration-dossier/-/registered-dossier/13348/6/2/2>)
- ^h Bringmann G and Kuehn R, 1977, Befunde der Schädigung wassergefährdender Stoffe gegen Daphnia magna. Z. Wasser-Abwasser-Forsch. 10, 161

⁸ This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods

- 2.6 Solubility in water at 20 °Cmiscible
- 2.7 Physical state at 20 °C (2.2.1.1) **liquid**
- 2.8 Appearance at normal transport temperatures, including colour and odourno data
- 2.9 Other relevant physical propertiesno data

Section 3. FLAMMABILITY ^b

- 3.1 Flammable vapour
- 3.1.1 Flash point (2.3.3)**28** °C cc
- 3.1.2 Is combustion sustained? (2.3.1.3) yes
- 3.2 Autoignition temperature **293** °C
- 3.3 Flammability range (LEL/UEL)no data
- 3.4 Is the substance a flammable solid? (2.4.2) no

Section 4. CHEMICAL PROPERTIES

- 4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity? no
- 4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.1) no
- 4.3 Is the substance a desensitized explosive? (2.4.2.4) no
- 4.4 Is the substance a self-reactive substance? (2.4.1) no
- 4.5 Is the substance pyrophoric? (2.4.3) no
- 4.6 Is the substance liable to self-heating? (2.4.3) no
- 4.7 Is the substance an organic peroxide? (2.5.1) no
- 4.8 Does the substance in contact with water emit flammable gases? (2.4.4) no
- 4.9 Does the substance have oxidizing properties? (2.5.1) no
- 4.10 Corrosivity (2.8) to:
- 4.10.1 mild steelno data
- 4.10.2 aluminium no data
- 4.10.3 other packaging materials (specify)
..... No data
- 4.11 Other relevant chemical propertiesno data

Section 5. HARMFUL BIOLOGICAL EFFECTS

- 5.1 LD₅₀, oral (2.6.2.1.1⁹)**156** mg/kg^c Animal species**Rat**
- 5.2 LD₅₀, dermal (2.6.2.1.2)>**631** - < **1000** mg/kg^d Animal species**Rabbit**
- 5.3 LC₅₀, inhalation (2.6.2.1.3)no data..... mg/l Exposure time.....**no data**
orml/m³ Animal species
- 5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3)**13800** ml/m³
- 5.5 Skin exposure (2.8) results: **Corrosive**^e Exposure time.....**4** hours
Animal species.....**Rabbit**
- 5.6 Other data^f

⁹ This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.

Corrosive, severe skin and eye irritant, reproductive toxicity, germ cell mutagenicity, carcinogenicity and specific target organ toxicity (single and repeated exposure)

Ecological toxicity

Fish (*Oryzias latipes*), LC₅₀ (96h) : 33mg/L^g

Aquatic invertebrates (*Daphnia magna*), EC₅₀ (24h) : 80mg/L^h

5.7 Human experience..... Not applicable
