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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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Annex: Provisional information dated 9 September 2011

Transmitted by the World Nuclear Transport Institute (WNTI)

Annex

Provisional information dated 9 September 2011

Data sheet to be submitted to the United Nations for new or amended classification of substances

Submitted by.....IAEA.....Dateblank.....

Supply all relevant information including sources of basic classification data. Data should relate to the product in the form to be transported. State test methods. Answer all questions - if necessary state "not known" or "not applicable" - If data is not available in the form requested, provide what is available with details. Delete inappropriate words.

Section 1 Substance identity

- 1.1 Chemical name: Uranium hexafluoride
- 1.2 Chemical formula: UF₆
- 1.3 Other names/synonyms
- 1.4.1 UN number:.....left blank. 1.4.2 CAS number: ..left blank.....
- 1.5 Proposed classification for the Recommendations: left blank
- 1.5.1 Proper shipping name (3.1.2^[a])... . left blank
- 1.5.2 Class/division: left blank
Packing group: left blank

Subsidiary risks .5.1 (oxidizing), 6.1 (toxic) are under investigation

- 1.5.3 Proposed special provisions, if any see left blank
- 1.5.4 Proposed packing instruction(s)..... see left blank

Section 2 Physical properties

- 2.1 Melting point or range..... 64.05 °C (triple point)
- 2.2 Boiling point or range 56.5 °C (sublimes)
- 2.3 Relative density at :
- 2.3.1 15 °C ...5.12 g/cm³.....
- 2.3.2 20 °C ..5.09 g/cm³.....
- 2.3.3 50 °C ...4.92. g/cm³.....
- 2.4 Vapour pressure at : (20 °C is 10,58 kPa^[b])
- 2.4.1 50 °C70.2.. kPa^[h]
- 2.4.2 65 °C156.56.. kPa^[h]
- 2.5 Viscosity at 20 °C^[c].....NA..... m²/s
- 2.6 Solubility in water at 20 °CNA..... g/100 ml (reacts with water)
- 2.7 Physical state at 20°C (2.2.1.1^[a]) solid^[c]

2.8 Appearance at normal transport temperatures, including colour and odour;
Colourless to white deliquescent crystals.

2.9 Other relevant physical properties.....

Section 3 Flammability

3.1 Flammable vapour

3.1.1 Flash point (2.3.3^[a]) °C oc/cc, NA.

3.1.2 Is combustion sustained? (2.3.1.3^[a]) NA

3.2 Autoignition temperature°C, NA

3.3 Flammability range (LEL/UEL)%, NA

3.4 Is the substance a flammable solid? (2.4.2^[a]) no

3.4.1 If yes, give details

Section 4 Chemical properties

4.1 Does the substance require inhibition/stabilization or other treatment such as nitrogen blanket to prevent hazardous reactivity? no

If yes, state:

4.1.1 Inhibitor/stabilizer used

4.1.2 Alternative method

4.1.3 Time effective at 55 °C

4.1.4 Conditions rendering it ineffective

4.2 Is the substance an explosive according to paragraph 2.1.1.1? (2.11) no

4.2.1 If yes, give details

4.3 Is the substance a desensitized explosive? (2.4.2.4[a]) no

4.3.1 If yes, give details
.....

4.4 Is the substance a self-reactive substance? (2.4.11) no

If yes, state:

4.4.1 Exit box of flow chart

What is the self-accelerating decomposition temperature (SADT) for a 50 kg package? °C

Is the temperature control required? (2.4.2.3.4^[a]) no

4.4.2 Proposed control temperature for a 50 kg package °C

4.4.3 Proposed emergency temperature for a 50 kg package..... °C

4.5 Is the substance pyrophoric? (2.4.31) no

4.5.1 If yes, give details

4.6 Is the substance liable to self-heating? (2.4.3^[a]) no

4.6.1 If yes, give details

- 4.7 Is the substance an organic peroxide (2.5.1^[a]) no
 If yes state:
 4.7.1 exit box of flow chart
 What is the self accelerating decomposition temperature (SADT) for a 50 kg package?..... °C
 Is temperature control required? (2.5.3.4.1^[a]) yes/no
 4.7.2 proposed control temperature for a 50 kg package °C
 4.7.3 proposed emergency temperature for a 50 kg package..... °C
 4.8 Does the substance in contact with water emit flammable gases? (2.4.4^[a]) no
 4.8.1 If yes, give details
 4.9 Does the substance have oxidizing properties (2.5.11) : under investigation
 4.9.1 If yes, give details: UF₆ readily oxidates organic compounds.
 4.10 Corrosivity (2.8^[a]) to: No data available. (the test 37)
 4.10.1 Mild steelmm/year at °C
 4.10.2 Aluminium.....mm/year at.....°C
 4.10.3 Other packaging materials (specify)
mm/year at..... °C
mm/year at..... °C
 4.11 Other relevant chemical properties:

Uranium hexafluoride (UF₆) combines with water to form the soluble reaction products UO₂F₂ and HF. UF₆ is (essentially) inert to most metals and fluorinated plastics and rubbers. Teflon is used in the valve packing and cap gasket of UF₆ cylinders. The use of glass is not advised because the presence of trace amounts of HF in UF₆ and residual moisture on the glass can result in rapid attack of the material.

Section 5 Harmful biological effects

- 5.1 LD50, oral (Human) (2.6.2.1.1^[a]): 1.63 mg/kg^{[b],[c]} (under investigation)
 5.2 LD50, dermal (2.6.2.1.2^[a])mg/kg Animal species
 5.3 LC50, inhalation (2.6.2.1.3^[a]) .. 942 mg/m³ Exposure time 10 minutes
 Animal species: rat^[d]... (under investigation)
 5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3^[a]): 104436 ml/m³^[b]
 5.5 Skin exposure (2.8^[a]) results: Highly corrosive (causes severe burns), effect based on the corrosivity of HF produced by the hydrolysis of UF₆^[b]
 Exposure time hours/minutes
 Animal species.....
 5.6 Other data: Radiological toxicity, mainly emit alpha particles that have little penetrating ability, the main radiation hazard from uranium occurs when uranium compounds are ingested or inhaled.

Specific activity of UF₆: 1.2x10⁴ ~ 2.3x10⁶ Bq/g (0.5% ~ 95% U-235)[e].

Acute toxicity to aquatic organisms: Likely to be high[b] , N[f]..(Not relevant to small quantity)

5.7 Human experience: Accidents in facilities.

LC50 (Human): 0.276 mg/litre. Exposure time 1 hour^[bl]. (under investigation)

Section 6 Supplementary information

6.1 Recommended emergency action

6.1.1 Fire (include suitable and unsuitable extinguishing agents)

6.1.2 Spillage

6.2 Is it proposed to transport the substance in:

6.2.1 Bulk Containers (6.8^[a])

6.2.2 Intermediate Bulk Containers (6.5^[a])?

6.2.3 Portable tanks (6.7^[a])?

If yes, give details in Sections 7, 8 and/or 9.

Section 7 Bulk containers (only complete if yes in 6.2.1)

7.1 Proposed type(s)

Section 8. Intermediate bulk containers (IBCs) (only complete if yes in 6.2.2)

8.1 Proposed type(s).....

Section 9. Multimodal tank transport (only complete if yes in 6.2.3)

9.1 Description of proposed tank (including IMO tank type if known).....

9.2 Minimum test pressure

9.3 Minimum shell thickness

9.4 Details of bottom openings, if any

9.5 Pressure relief arrangements

9.6 Degree of filling

9.7 Unsuitable construction materials .

Endnote:

- [a] This and similar references are to chapters and paragraphs in the Model Regulations on the Transport of Dangerous Goods.
- [b] IUCLID: EUROPEAN COMMISSION – European Chemicals Bureau, http://esis.jrc.ec.europa.eu/doc/existing-chemicals/IUCLID/data_sheets/7783815.pdf
- [c] See definition of "liquid" in 1.2.1 of the Model Regulations on the Transport of Dangerous Goods.
- [d] The Registry of Toxic Effects of Chemical Substances (RETCS), <http://www.cdc.gov/niosh-rtecs/yr480580.html>
- [e] IAEA TECDOC – 423: RECOMMENDATIONS FOR PROVIDING PROTECTION DURING THE TRANSPORT OF URANIUM HEXAFLUORIDE, <http://nelib-w1/lib/Tecdods/0423.pdf>
- [f] International Chemical Safety Cards 1250, <http://www.cdc.gov/niosh/ipcsneng/neng1250.html>
- [g] Uranium hexafluoride: a survey of the physico-chemical properties, R. DeWitt, GAT-280, the GOODYEAR atomic cooperation, Portsmouth Ohio, 1960.
- [h] Oliver, G. D., Milton, H.T. and Grisard, J.W., The Vapor Pressure and Critical Constants of Uranium Hexafluoride, J. Am. Chem. Soc., 75, 2827-9 (1953)
- [i] IAEA – TECDOC- 608: Interim guidance on the safe transport of uranium hexafluoride
http://www-pub.iaea.org/MTCD/publications/PDF/te_608_prn.pdf