

**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals**

25 November 2019

**Sub-Committee of Experts on the
Transport of Dangerous Goods**

Fifty-sixth session,

Geneva, 4-10 December 2019

Item 3 of the provisional agenda

Listing, classification and packing

**Request for a new UN number and Special Provisions for fine
Cobalt dihydroxide powder, and similar compounds classified
under REACH and GHS as Category 1 Toxic by inhalation,
and consequentially TDG Class 6 and Packing Group I and
lunchtime meeting of the informal intersessional group
Thursday 5th December**

**Transmitted by the Responsible Packaging Management Association of
Southern Africa (RPMASA), the European Chemical Industry Council
(CEFIC) and the International Confederation of Plastics Packaging
Manufacturers (ICPP)**

Introduction and background

1. At the fifty-fifth session RPMASA introduced a new challenge experienced for Packaging and Transport, through the REACH Requirement for comprehensive GHS Testing, which had resulted in the drastic reclassification of Cobalt dihydroxide from Transport Class 9, UN 3077 ENVIRONMENTALLY HAZARDOUS SOLID, N.O.S. Packing Group III, to Class 6.1 Toxic by inhalation Category 1, and Packing Group 1.
2. This presented a serious challenge as more than 200,000 tonnes have been transported annually as UN 3077 ENVIRONMENTALLY HAZARDOUS SOLID, N.O.S. (contains cobalt dihydroxide) in flexible IBCs of PG III.
3. Cobalt dihydroxide had been safely shipped around the world for several decades in different forms, from crude material ex the mines in Africa, to high moisture content paste forms, and very fine refined powders, by multi-modal means in flexible IBC's of PGIII. This change presented a serious challenge as flexible IBC's are not assigned to PGI.
4. Cobalt is a key strategic mineral used in various advanced medical and technical applications around the world, hence essential to keep the supply chains open, and a new UN number with Special Conditions was requested to allow the continued use of flexible IBC's.

The Challenge/Problem and subsequent actions taken

5. Concern was expressed that this could be the first of fine powders to be impacted and thus a solution was needed to ensure continued trade, and, ensure implementation of the first Principle of the Recommendations on the Transport of Dangerous Goods are respected i.e. “Transport of dangerous goods is regulated in order to prevent, as far as possible, accidents to persons or property and damage to the environment, the means of transport employed or to other goods. At the same time, regulations should be framed so as to not impede the movement of such goods, other than those too dangerous to be accepted for Transport”.
6. Cobalt dihydroxide is not too dangerous to transport as it has no other high consequence physical transport hazards i.e. not explosive, self-reactive, oxidising etc. and it has been safely shipped in large quantities for over 40 years, initially as non-hazardous and then as Class 9 with no recorded accidents, incidents or health issues.
7. Initial testing had been done on a selection of very fine, refined material as required in the EU for compliance with the REACH Regulation using OECD Guideline 436 for a 4hr exposure to rats, This resulted in classification of Acute Toxicity by inhalation Category 1. This testing differs significantly from the TDG requirement for testing of material “as shipped” in Chapter 2.6.
8. It should be noted that Paragraph 2.6.2.1.3 of the UN Model Regulations states that a solid substance shall be tested if at least 10% by mass of the dust is in the respirable range e.g. the aerodynamic diameter of that particle fraction is 10 micron or less.
9. Subsequent particle size testing confirmed that the fine refined material fell into the respirable range of < 10µm and that the crude and slightly coarser materials did not, also that the pasty materials containing high moisture content did not emit dust that was measurable, hence did not pose a hazard to inhalation.
10. It was confirmed that these materials outside the respirable range could continue to be shipped as Class 9, ENVIRONMENTALLY HAZARDOUS, SOLID, N.O.S. PGIII.
11. The Cobalt Institute arranged repeat testing of the fine refined material using the Transport parameters of a sample representative of the material “as shipped” - very different to the GHS of “using only the finest selected material”. Unfortunately, this test confirmed the results of the previous test of Toxic by inhalation Category 1 – These test results were circulated to Experts at the 55th session.
12. It should be noted that TDG Chapter 2.6.2.2.2 states that “In making assignment to Packing Groups, account shall be taken of human experience”.
13. As stated in paragraph 3, there have been no recorded or known health issues arising from transport of these materials, or during loading or unloading operations, however following the recent EU GHS Classification, shippers voluntarily changed from using unlined flexible IBC’s to using a lined 13H3 or 13H4 flexible IBCs to prevent dust.
14. In addition, industry had developed a new design type flexible IBC with an improved liner to prevent egress of dust. This new design type 13H3 flexible IBC had been tested to Packing Group I by the Belgium Competent Authorities and approved.
15. There was considerable interest and support for finding both a short-term and long-term solution to this challenge as there is currently no UN Number for INORGANIC SOLID, TOXIC BY INHALATION, N.O.S. only UN 3382 TOXIC BY INHALATION, LIQUIDS, N.O.S. or UN 3288 TOXIC SOLID, INORGANIC, N.O.S. which does not accurately describe the inhalation hazard.
16. Further it should be noted that most of Chapter 2.6.2.2.4.3 onwards is related to classification and assignment of packing groups for liquids and vapours, not solids.

17. The report on the fifty-fifth session of the TDG Sub-Committee paragraph 45. recorded “The Sub-Committee welcomed the proposal and recommended to first to consider the appropriate classification of such substances in its various forms, subject to tests, then to specify the transport conditions and packagings. The expert from RPMASA volunteered to share further data and test reports with all interested delegates and offered an exchange of views during the week on the best way forward. A lunchtime meeting was held to discuss this subject, and it was further agreed to follow-up through an intersessional correspondence group. ».

18. Outcomes of the lunchtime meeting included that -

(a) Currently the most appropriate UN number available was UN3288 TOXIC SOLID, INORGANIC, N.O.S. (which does not specifically address inhalation toxicity), should be used until a permanent long-term solution was agreed.

(b) A solution to use of the new design type flexible IBC could be by way of special provisions against a new UN number for either Cobalt dihydroxide or a generic such as INORGANIC SOLID, TOXIC BY INHALATION, N.O.S.

(c) To solve the immediate challenge in the EU a Multilateral Agreement under ADR could be tabled at the RID/ADR/ADN Joint Meeting which would have to be agreed between all EU countries involved in consignment, traverse and receiving of this fine powder.

(d) Agreement that both short-term and permanent solutions were needed to address this as greater harmonisation with the GHS may lead to more materials being reclassified in terms of health exposures.

(e) An intersessional informal correspondence group would be formed through which Experts could give further inputs, after consideration with their respective stakeholders.

(f) The Belgium Competent Authorities expressed their willingness to take forward a proposal to the RID/ADR/ADN Joint Meeting for a Multilateral Agreement to use the new design type bag as 13H3 or 13H4. They reported that the new 13H3 bag was tested and approved to PGI using cobalt dihydroxide powder and exceeded TDG requirements with NO egress of dust during testing.

(g) A number of experts felt that 13H4 offered greater protection than 13H3.

19. Test results of toxicity testing of the fine material and for the new design type bag were circulated as requested after the Plenary discussion, by email to experts for further deliberations with their Stakeholders.

20. RPMASA requested that experts who were not able to attend the lunchtime meeting but would like to be included in the corresponding group to advise them so that they would be included in future communications.

Actions taken

21. The Belgium Authorities had tabled a Multilateral Agreement at the RID/ADR/ADN Joint Meeting – see informal document INF.23 from the September session, together with the attachments. It was recorded in the Joint Meeting report Item 16 paragraph 40 that – “*The representative from Belgium informed the Joint Meeting about possible use of an improved flexible IBC meeting the requirements described in INF 23. He added that *specific provisions for loading, unloading and carriage were necessary. He announced that a more detailed discussion on possible amendments would take place at the next session of the TDG Sub-Committee. Also, his intention to circulate a multilateral agreement as an interim solution. The Joint Meeting endorse that procedure and agreed to resume considerations at its next session.*”

*These took into consideration and reference the 2014 IMO/ILO/UNECE Code of Practice requirements for CTU - Container Transport Unit Packing.

22. RPMASA corresponded with members of the Cobalt Institute sector and those experts who indicated that they wished to participate in the Intersessional corresponding group.

23. A Conference call was held with industry members to further progress actions which included to

- (a) Research to try and identify other solids /powders which meet Class 6.1, Acute toxicity by inhalation, PGI?;
- (b) Progress manufacture of the new design type flexible IBC by an alternate packaging manufacturer for PGI test and approval by the Belgium competent authority?;
- (c) Establish what other material Switzerland expressed concern over for this hazard?;
- (d) Establish if it was possible to pelletise the material to reduce hazard?;
- (e) Would a specific UN number for cobalt dihydroxide be adequate to cover mixtures containing this, in fine respirable powder form?;
- (f) Test for dust - if any in a container after transport using the new design type bags?.

24. A status update informing all in the Intersessional Corresponding Group (ICG), especially those outside of the EU, was circulated to all participants, sharing the Belgium competent authority proposal to the RID/ADR/ADN Joint Meeting regarding a Multilateral Agreement for continued use of the new design type flexible IBC for Cobalt dihydroxide.

25. A Conference call was then held on the 13th November with Members of the ICG to discuss progress with relation to

- (a) The Belgium competent authority proposed Multilateral Agreement ;
- (b) Update on industry actions – proposed dust test, it was queried if a control was needed to preclude any external dust. The cobalt industry informed that it would be possible to test for cobalt presence in any dust that may be collected, thus preclude any obscuration from any possible external sources ;
- (c) Best options for a new UN number, proper shipping name, packing group, packing instruction;
- (d) Whether a specific or generic number and proper shipping name would be more appropriate to encompass the pure cobalt dihydroxide, as well as mixtures containing cobalt dihydroxide of similar fine, respirable particle size;
- (e) Possible special provisions for continued use of new design type flexible IBC for PGI.

26. Various options were discussed on each of these items with eventual consensus that it would be appropriate to propose to the Sub-Committee:

- (a) A new specific UN No. 35XX COBALT DIHYDROXIDE, FINE POWDER, TOXIC BY INHALATION for pure material, and
- (b) A new generic UN No. 35XY for mixtures containing fine cobalt dihydroxide of respirable size.

27. It was clarified that currently flexible IBC's *were not assigned* for Packing Group I, rather than not allowed, thus an appropriate approach should be formulated to propose to the Sub-Committee for approval.
28. It was also noted that UN 3288 TOXIC SOLID, INORGANIC, N.O.S. currently proposed was assigned IBC99 which allows Competent Authorities to authorise, when a copy of the CA approval shall accompany each consignment.
- (a) However, this is not allowed under ADR which assigns IBC07 which does not assign use of flexible IBC's and hence need for a Multilateral Agreement
 - (b) US DOT, CFR49 similar to the ADR assigns IBC07, but it is possible to apply for a special permit for Road transport in alternate packagings.
 - (c) IBC08 however does allow for use of flexible IBC's with a B3 Special packing provision which requires a sift-proof and water-resistant liner.
 - (d) Another challenge is that UN 3288 does not really address the inhalation hazard as it is allowed by ICAO for up to 5kg on passenger aircraft and 50kg on cargo aircraft – this is not appropriate or allowed for substances toxic by inhalation!!
29. Consensus was that both a new UN specific number as well as a generic UN number should be considered to encompass all types of respirable solid/powder containing cobalt dihydroxide for packing in flexible IBC's.
30. It was proposed further that IBC07 could be amended with a Special Provision for use with Cobalt dihydroxide allowing the new design type flexible IBC approved for PGI – citing that IBC07 had been successfully used by ADR and US DOT for road transport of materials of UN 3288.

Proposed solutions

31. In order to address the challenge where there is currently no specific UN number and Proper Shipping Name that addresses INORGANIC SOLID, TOXIC BY INHALATION, N.O.S. and that both the pure, refined material, and mixtures containing this need to be addressed, it is proposed to Assign 2 new UN numbers
- (a) UN35XX COBALT DIHYDROXIDE, *FINE POWDER, TOXIC BY INHALATION, PGI * containing more than 10% respirable particles, and
 - (b) UN 35XY INORGANIC SOLID, TOXIC BY INHALATION, N.O.S., PGI for fine powders containing cobalt dihydroxide and more than 10% respirable particles
32. Assign packing instruction IBC07 with a special provision allowing that the new design type flexible IBC of 13H3 or 13H4 as CA approved for PGI may be used with these PGI materials as per clause 30.
33. Amend the Dangerous Goods List as per tables below.
34. Identify any consequential amendments required by such proposed changes in 4.1. or 6.5.
35. Request the IMO, ADR and other jurisdictions to adopt the same approach to enable continuity of seamless shipments in the Supply Chain to safely facilitate Trade.
36. Proposed new UN numbers for the stated fine powders containing more than 10% respirable particle.

Alternate UN 35XY could be a generic TOXIC BY INHALATION, INORGANIC SOLID, N.O.S.

UN No.	Name and description	Class or division	Subsidiary risk	UN packing group	Special provisions	Limited & excepted quantities		Packagings and IBCs		Portable tanks and bulk containers	
								Packing instruction	Special packing provisions	Instructions	Special provisions
35XX	COBALT DIHYDROXIDE POWDER containing > than 10% respirable particles	6.1		I	xxx	0	E5	P002 IBC07	Add B3	T6	TP33
35XY	INORGANIC SOLID, TOXIC BY INHALATION.N.O.S.	6.1		I	xxx	0	E5	P002 IBC07 or IBC08	B3	T6	TP33

37. RPMASA would like to confirm that a meeting of the informal intersessional group will be held during the lunchtime break on Thursday 5th December.

Annex

DATA SHEET SUBMITTED TO THE UNITED NATIONS FOR NEW OR AMENDED CLASSIFICATION OF SUBSTANCES

Submitted by RPMASA / The Cobalt Institute

Date 2 June 2019

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 data is not available in the form requested, provide what is available with details. Delete inappropriate words.

Section 1. SUBSTANCE IDENTITY – **Refined Cobalt Dihydroxide Powder**

1.1 Chemical name **Cobalt Dihydroxide**

1.2 Chemical formula **Co(OH)₂**

1.3 Other names/synonyms **Cobalt (II) Hydroxide, Cobaltous Hydroxide**

1.4.1 UN number **35XX**

1.4.2 CAS number **21041-93-0**

Currently shipped as -

UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. Class 9 in flexible IBC's

1.5 Proposed Classification for the Recommendations

1.5.1 Proper Shipping Name (3.1.2.1) **COBALT DIHYDROXIDE POWDER, TOXIC BY INHALATION, containing more than 10% respirable particles**

1.5.2 Class/division **6.1** Subsidiary Hazard(s) **Environmentally hazardous**

Packing Group **I**

1.5.3 proposed Special Provisions, if any – **SP XXX other forms of this material are not covered by this entry and - B3 for use with 13H3 and/or 13H4 flexible IBC**

1.5.4 proposed packing instruction(s) **IBC 07 or 08**

Section 2. PHYSICAL PROPERTIES – **solid – fine powder**

2.1 Melting point or range **Decomposes at approximately 160°C**

2.2 Boiling point or range°C

2.3 Relative density at:

2.3.1 15 °C

2.3.2 20 °C **3.6**

2.3.3 50 °C

- 2.4 Vapour pressure at: **N/A solid**
 - 2.4.1 50 °C kPa
 - 2.4.2 65 °C kPa
- 2.5 Viscosity at 20 °C $2 \text{ m}^2/\text{s}$
- 2.6 Solubility in water at 20 °C **2.2×10^{-4} g/100 ml**
- 2.7 Physical state at 20°C (2.2.1.1) **Solid - powder**
- 2.8 Appearance at normal transport temperatures, including colour and odour -

Pink Odourless Powder

- 2.9 Other relevant physical properties.....
.....

Section 3. FLAMMABILITY – **N/A**

- 3.1 Flammable vapour
 - 3.1.1 Flash point (2.3.3.1) °C oc/cc
 - 3.1.2 Is combustion sustained? (2.3.1.3.1) **yes/ NO**
- 3.2 Autoignition temperature°C
- 3.3 Flammability range (LEL/UEL) %
- 3.4 Is the substance a flammable solid? (2.4.2.1) **yes/ 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? **yes/ 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? (2.1.1) **yes/ NO**
 - 4.2.1 If yes, give details

4.3 Is the substance a desensitized explosive? (2.4.2.4i) ~~yes~~ **NO**

4.3.1 If yes, give details

4.4 Is the substance a self-reactive substance? (2.4.1i) ~~yes~~ **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? (2.4.2.3.4i) ~~yes~~ **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? (2.4.3i) ~~yes~~ **NO**

4.5.1 If yes, give details

4.6 Is the substance liable to self-heating? (2.4.3i) ~~yes~~ **NO**

4.6.1 If yes, give details

4.7 Is the substance an organic peroxide (2.5.1i) ~~yes~~ **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? (2.5.3.4.1i) ~~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? (2.4.4i) ~~yes~~ **NO**

4.8.1 If yes, give details

4.9 Does the substance have oxidizing properties (2.5.1i) ~~yes~~ **NO**

4.9.1 If yes, give details

4.10 Corrosivity (2.8i) to: **N/A not corrosive to metals**

4.10.1 mild steel mm/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.....
.....

Section 5. HARMFUL BIOLOGICAL EFFECTS

5.1 LD₅₀, oral (2.6.2.1.1i) **1060** mg/kg Animal species **RAT (OECD guideline test 401)**

5.2 LD₅₀, dermal (2.6.2.1.2i)mg/kg Animal species

5.3 LC₅₀, inhalation (2.6.2.1.3i) **<0.2** mg/litre Exposure time **1** hour/s
or ml/m³ Animal species **RAT**

5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3i) **N/A powder** ml/m³

5.5 Skin exposure (2.8i) results Exposure time hours/minutes
Animal species

5.6 Other data

5.7 Human experience

No known fatalities or adverse health effects following human exposure, over several decades of productions, transport and use, with over 3,000 Tonnes / year transported by road, rail, inland waterways and sea.

Section 6. SUPPLEMENTARY INFORMATION

6.1 Recommended emergency action

6.1.1 Fire (include suitable and unsuitable extinguishing agents)

Should the material be involved in a fire, use agents appropriate for surrounding environment

6.1.2 Spillage **Do not allow to enter drains, or water courses**

6.2 Is it proposed to transport the substance in:

6.2.1 Bulk Containers (6.8i) ~~yes~~ **NO**

6.2.2 Intermediate Bulk Containers (6.5i)? **YES** /~~no~~

6.2.3 Portable tanks (6.7i)? ~~yes~~ **NO**

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) – N/A

Section 8. INTERMEDIATE BULK CONTAINERS (IBCs) (only complete if yes in 6.2.2)

8.1 Proposed type(s)

IBC 08 – flexible IBC 13H3 and/or 13H4

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)

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9.2 Minimum test pressure

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9.3 Minimum shell thickness

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9.4 Details of bottom openings, if any

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9.5 Pressure relief arrangements

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9.6 Degree of filling

.....

9.7 Unsuitable construction materials

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