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

13 June 2019

Sub-Committee of Experts on the Transport of Dangerous Goods

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Item 3 of the provisional agenda,

Listing, classification and packing

Request for a new UN number and Packing Group for refined cobalt dihydroxide powder, and to review Class 6.1 and Packing groups as currently equated to GHS Classification for inhalation toxicity

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

Firstly, our apologies that this topic was not placed on the programme of work for 2019 as the full ramifications for Transport were only understood in December 2018.

1. Cobalt dihydroxide in various forms has been safely shipped around the world for several decades.

2. More than 200,000 tonnes are transported annually as UN 3077 ENVIRONMENTALLY HAZARDOUS SOLID, N.O.S. (contains cobalt dihydroxide) in flexible IBCs of PG III.

3. Essentially there are 3 different forms of cobalt dihydroxide transported by multi-modal means:

(a) Crude ex the mines which is a mixture of minerals containing predominately cobalt hydroxide together with cobalt sulphate, copper and nickel sulphates. Over 50% of global production is mined in the Democratic Republic of the Congo (Africa) and shipped by road to Southern African Ports where it is containerised for shipping around the world to China, Japan, South Korea, Australia, South and North America, Canada and the EU where it is refined for use in various key medical and technical applications;

(b) Partly refined with very high moisture content in the form of lumpy paste which prevents formation of any free dust;

(c) Refined – generally greater than 99% pure cobalt dihydroxide powder which is transported many thousands of miles by road and sea.

4. Cobalt is a key strategic mineral used in various advanced medical and technical applications around the world.

5. Mining and export of crude cobalt dihydroxide contributes significantly to the economies of developing countries in Africa.

6. 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 are now using 13H3 or 13H4 lined flexible IBCs to prevent dust.

7. Recent testing required for compliance with the REACH Regulation in the EU, and subsequent evaluation against the hazard classification criteria of the EU CLP Regulation (GHS) resulted in a classification of Acute toxicity by inhalation Category 1, H330 Fatal if inhaled. This classification was then equated to Transport Class 6.1 and Packing Group 1 - a drastic change!

8. This presents a serious challenge for the very large quantities transported around the world, as flexible IBCs are currently not allowed for Packing Group 1.

9. The principles in the Recommendations on the Transport of dangerous goods paragraph 4. states that -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 goods, other than those too dangerous to be accepted for transport.

10. 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.

11. It was decided that further work was required to ascertain if this single test on rats is correct and applicable to all forms of cobalt dihydroxide or not, as it was thought that the crude material would not be in the respirable range (<10 microns).

12. Paragraph 2.6.2.1.3 of the 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.

The Challenge/Problem

13. In 2017 the members of the Cobalt Institute (CI) and the Cobalt REACH Consortium (CoRC) evaluated cobalt dihydroxide against the criteria for classification under EU CLP Regulation and GHS, based on data generated under the EU REACH Regulation.

14. The data requirements of the REACH Regulation included Testing for Acute toxicity inhalation following the OECD Guideline 436 using 4hour exposure to rats. As required by the REACH Regulation and agreed by the Cobalt REACH Consortium the finest – smallest particles were used for the test. This resulted in a Classification of Acute toxicity by inhalation Category 1.

15. However, the testing was done using a 4hour test on a sample of the finest particles of the refined material as required by REACH and CLP, all of which was in the respirable range of below 10 micron, whereas Transport Class 6.1 criteria for inhalation toxicity of dusts and mists 2.6.2.1.1 - .3, is based on LC50 data related to 1hour exposure using material representative of the material to be shipped. This is very different to using only the finest particles.

16. Further 2.6.2.2.2 states in making assignment to Packing Groups, account shall be taken of human experience - N.B. Hazard x Exposure = Risk. Thus, where there is no or

limited exposure as in transport, which prescribes UN Certified sift proof packaging with a liner, the risk of exposure is minimal.

17. Unforeseen consequences of the EU CLP Self-classification resulting in Acute Toxicity by inhalation Category 1, is that the Transport Class changed from Class 9 Environmentally Hazardous Substance PGIII to Class 6.1 Toxic and PGI, a drastic change, where under the current TDG Packaging Instructions flexible IBCs are not allowed for PGI.

18. This unintended consequence would incur prohibitive costs which would make the material uneconomic to ship, with further economic and industry implications.

19. Consequential and economic impacts of restriction on the use of flexible IBCs for packaging, would include:

(a) Smaller packs e.g. 25 kg bags or drums, would significantly increase costs of primary packaging, palletising and overwrapping, and additionally increase the potential for human exposure during the packaging process;

(b) The refineries would have to change their filling and handling facilities which are designed to safely handle flexible IBCs mechanically. This would entail high costs;

(c) The receiving facilities would have to change /modify their receiving, handling and emptying facilities which are currently designed to safely handle flexible FIBCs with minimal dust. This change would be costly and additionally require the handling and emptying of several smaller packs or drums instead of a 1 large flexible IBC, which would pose potentially higher exposure risks to workers.

20. Currently the only cobalt compounds with specific UN numbers are: UN2001 COBALT NAPHTHENATES, POWDER, Class 4.1, PG III UN1318 COBALT RESINATE, PRECIPITATED, Class 4.1 PG III These are not designated toxic by inhalation, or other route.

21. There are currently no UN Numbers for INORGANIC SOLID, TOXIC BY INHALATION, N.O.S. only TOXIC BY INHALATION, LIQUIDS, N.O.S. UN3382.

22. Results on particle size test of the crude cobalt dihydroxide ex the mines confirmed that this is outside the respirable range, and the partly refined and damp material is pasty with no dust. These are both now packed in 13H3 or 13H4 flexible IBCs as per IBC08 and B3, hence they can continue to be shipped as UN3077 ENVIRONMENTALLY HAZARDOUS SOLID, N.O.S. (Contains cobalt dihydroxide).

Proposed solutions

23. Refined COBALT DIHYDROXIDE – it is proposed to assign a separate UN number UN 35XX as Class 6.1 and PG II. Reasons being.

24. Some 3,100 tonnes of refined materials have been safely transported annually for several decades with NO recorded or reported adverse health effects or deaths from loading, off-loading and transport operations i.e. positive Human experience.

25. Exposure to persons during transport is extremely low, whereas exposures during use could be considerably higher. Change of packaging from flexible IBCs which are mechanically filled, handled and emptied to smaller packs which require more handling to fill, palletise, load, offload and then empty would increase potential exposure of workers to the inhalation hazard.

26. Use of a 13H3 flexible IBCs with liner or a 13H4 coated plastic flexible IBCs with a liner + longer filling tube to be properly secured after filling, would preclude any escape of dusts during transport.

27. *A further concern is regarding the potential for this GHS Classification to be extended to other fine powders with particles in the respirable range, to toxic by inhalation and PGI, thus raising a barrier to use of* flexible IBCs *for transport of large quantities, especially of minerals, and hence, impede the movement of goods, which have no other high consequence hazards. This could potentially become a barrier to International Trade if not addressed timeously*.

28. It is proposed therefore to review and revise the use of flexible IBCs for materials designated PGI from the GHS Acute toxicity test as this is deemed to be overly stringent for transport, especially shipping, where use of closed containers further removes potential exposures to persons. It is thus proposed to amend Packing Instructions IBC08 and any other consequential amendments that may be necessary to either default the PG to PGII or, allow for use of PGI flexible IBCs.

29. Tests have already been carried out on a new 13H3 flexible IBCs in Belgium. These new bags filled, with fine powder, have passed the additional test requirements for PGI, and using the better designed liners with longer filling spouts resulted in NO significant loss of dust - results can be provided by the Belgium Competent Authority. Before such flexible IBCs can actually be used for transport, the Belgian Competent Authorities want to hear from the Sub-Committee if it would be willing to accept the use of flexible IBCs for this specific case where the use of flexible IBCs for many years has not given rise to any incidents and where the majority of industry is well adapted to, and depends on the use of flexible IBCs for smooth functioning of their operations.

Proposal for new UN numbers and amendments to the DGL the informal working group requests the Committee to consider -

30. Assign a new UN Number

Option 1 UN35XX for COBALT DIHYDROXIDE POWDER, TOXIC BY INHALATION, (containing more than 10% respirable particles) with a Special Provision xxx that – Other forms of this material are not covered by this entry.

Refer attached DATA SHEET as per Fig 1 of the UN Model Regulations.

Option 2 UN 35XY INORGANIC SOLID, TOXIC BY INHALATION, N.O.S.

31. Amend the Dangerous Goods List as per tables below.

32. The informal Corresponding Group further requests the Committee to review

(i) the transport criteria in 2.6.2 and for dusts assigned by the GHS as toxic by inhalation, as to the practicality of assigning PGI when no other high consequences hazards exist, acknowledging that exposure during transport is minimal;

(ii) the current preclusion of use of bags for PGI.

33. Amend the Packing Instructions to confirm flexible IBCs with liners of

Option 1 13H3

Option 2 13H4

may be used for transport of PGI Materials.

34. Identify any consequential amendments required by these proposed changes in 4.1. or 6.5.

35. Request the IMO, ADR and other jurisdictions to adopt the same approach to enable continuing of seamless shipments in the Supply Chain.

The Informal Corresponding Group apologises that this item was not placed on the programme of work for 2019, as the full ramifications were only recognised in December 2018.

Proposed new UN number for COBALT DIHYDROXIDE POWDER (containing more than 10% respirable particles).

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

UN No.	**Name and description**	**Class or division**	**Subsi-diary risk**	**UN packing group**	**Special provi-sions**	**Limited and 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 IBC08	B3	T6	TP33
35XY	INORGANIC SOLID, TOXIC BY INHALATION, N.O.S.	6.1		I, II or III		0	E5	P002 IBC08	B3	T6	TP33

Annex

DATA SHEET TO BE 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 FIBC'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** or **II**

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 FIBC**

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

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

2.1 Melting point or range **Decomposes at approximately 160ºC**

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 °C2 m2/s

2.6 Solubility in water at 20 °C **2.2 x 10 – 4** g/100 ml

2.7 Physical state at 20°C (2.2.1.11) **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 (2.3.31) ..... °C oc/cc

3.1.2 Is combustion sustained? (2.3.1.31) ~~yes~~/ **NO**

3.2 Autoignition temperature .....°C

3.3 Flammability range (LEL/UEL) ..... %

3.4 Is the substance a flammable solid? (2.4.21) ~~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? (2.11) ~~yes~~/ **NO**

4.2.1 If yes, give details .....

4.3 Is the substance a desensitized explosive? (2.4.2.4[1]) ~~yes/~~ **NO**

4.3.1 If yes, give details .....

4.4 Is the substance a self-reactive substance? (2.4.1[1]) ~~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? (2.4.2.3.4[1]) ~~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? (2.4.3[1]) ~~yes~~/ **NO**

4.5.1 If yes, give details .....

4.6 Is the substance liable to self-heating? (2.4.3[1]~~) yes/~~ **NO**

4.6.1 If yes, give details .....

4.7 Is the substance an organic peroxide (2.5.1[1]) ~~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? (2.5.3.4.1[1]) ~~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[1]) ~~yes/~~ **NO**

4.8.1 If yes, give details .....

4.9 Does the substance have oxidizing properties (2.5.1[1]) ~~yes~~/ **NO**

4.9.1 If yes, give details .....

4.10 Corrosivity (2.8[1]) 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 LD_{50}, oral (2.6.2.1.1[1]) **1060** mg/kg Animal species **RAT (OECD guideline test 401)**

5.2 LD_{50}, dermal (2.6.2.1.2[1]) .....mg/kg Animal species .....

5.3 LC_{50}, inhalation (2.6.2.1.3[1]) **<0.2** mg/litre Exposure time **1** hour/s

or .... ml/m^3 Animal species **RAT**

5.4 Saturated vapour concentration at 20 °C (2.6.2.2.4.3[1]) **N/A powder** ml/m^3

5.5 Skin exposure (2.8[1]) 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 (6.8[1]) ~~yes~~/ **NO**

6.2.2 Intermediate Bulk Containers (6.5[1])? **YES** /~~no~~

6.2.3 Portable tanks (6.7[1])? ~~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

.....

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

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