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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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Item 3 of the provisional agenda
Listing, classification and packing

Revised shipping name and description for sodium dithionite (UN1384)

Transmitted by the expert from Canada[1]

Purpose

1. To amend the current name and description of UN1384 SODIUM DITHIONITE to UN1384 SODIUM DITHIONITE, SOLID to better communicate that the solid or anhydrous form is the regulated dangerous goods.

Introduction

2. The expert from Canada recommends that the name and description for Sodium Dithionite (UN1384) explicitly state that the solid or anhydrous form is the regulated dangerous goods. This change is recommended to avoid situations where solutions of sodium dithionite may be mistakenly considered and handled as dangerous goods.

Background

3. Sodium dithionite, also referred to as sodium hydrosulfite or sodium hydrosulphite, is an important industrial chemical. As a strong reducing agent, sodium dithionite is often

[1] In accordance with the programme of work of the Sub-Committee for 2015–2016 approved by the Committee at its seventh session (see ST/SG/AC.10/C.3/92, paragraph 95 and ST/SG/AC.10/42, para. 15).

used as a bleaching agent in the textile and paper industries. Similarly, the chemical has proven successful in the treatment of heavy metal waste[2].

4. Solid anhydrous sodium dithionite decomposes exothermically in air on prolonged exposure to temperatures above 90°C to yield sodium sulphate (Na_2SO_4) and sulfur dioxide (SO_2). Above 150°C, in exclusion of air, vigorous decomposition occurs, yielding mainly sodium sulphite (Na_2SO_3), sodium thiosulfate ($Na_2S_2O_3$), sulfur dioxide (SO_2) and small amounts of sulfur[3]. Sulfur dioxide is known as a respiratory irritant to humans and is regulated as dangerous goods (i.e., UN1079).

5. Sodium dithionite, as an anhydrous solid, is known to undergo rapid exothermic decomposition in air on contact with a small amount of moisture. This reaction can give rise to such intense heat that it burns with a flame and ignites nearby combustible materials. Given the highly exothermic nature of the decomposition reaction, sodium dithionite (in its solid form) is classified as Class 4.2, Packing Group II – substances liable to spontaneous combustion.

6. Sodium dithionite, in solution, decomposes/disproportionates to sulfite, sulfur dioxide, and sodium thiosulfate as major decomposition products. The rate of decomposition proceeds faster under acidic conditions and oxygen consumption. For instance, decomposition was found to be rapid at pH values less than 5.5[4]. Although the decomposition reaction can release sulfur dioxide under strongly acidic conditions, this is not likely to occur under normal natural environmental conditions[5]. It is unlikely that sodium dithionite solution is transported under conditions that may cause a decomposition reaction – the solution is shipped under alkaline conditions to limit any such decomposition and preserve its value as a commercial reagent.[6] The other major decomposition products are not considered as dangerous goods.

7. Stable sodium dithionite solutions (i.e., limited rate of decomposition) can be maintained with cooled, alkaline and oxygen-excluded environments.

8. Recently, in Canada, an incident occurred where a tank spilled sodium dithionite solution. The emergency responder contacted Transport Canada's CANUTEC[7] office to determine the most appropriate emergency measures for the situation. CANUTEC provided measures to address sodium dithionite (solid form), as the respondent did not specify the form of the chemical (i.e., solution versus solid). Sodium dithionite in solution is not regulated as a dangerous good. Inappropriate response can be costly, harmful to the reputation of a company, and can affect its operations. It is therefore important that these types of situations be avoided.

9. The applicable portable tank special provision (i.e., TP33) for sodium dithionite (UN1384) supports the UN Model Regulations' intent to have the solid form of the chemical regulated as dangerous goods. TP33 refers to portable tanks for granular and powdered solids.

[2] http://www.tandfonline.com/doi/abs/10.1080/10426507.2014.914939#.VD7AZ2OZiPU
[3] http://www.inchem.org/documents/sids/sids/7775146.pdf
[4] Ibid.
[5] Ibid.
[6] http://www.chemtradelogistics.com/main/wp-content/uploads/Sodium_Hydrosulfite_Solution-English.pdf
[7] CANUTEC is the Canadian Transport Emergency Centre operated by the Transportation of Dangerous Goods Directorate of Transport Canada. The Directorate's overall mandate is to promote public safety in the transportation of dangerous goods by all modes.

10. Sodium dithionite solution aligns with the requirements outlined in paragraph 2.0.2.7 of the UN Model Regulations', which state that "a mixture or solution containing one or more substances identified by name in these Regulations or classified under a N.O.S. entry and one or more substances is not subject to these Regulations if the hazard characteristics of the mixture or solution are such that they do not meet the criteria (including human experience criteria) for any class". Therefore, it is recommended that the reference to sodium dithionite (UN1384) in the UN Model Regulations be clarified to explicitly reference the chemical in its solid form; the dangerous goods classification does not extend to solutions of sodium dithionite.

Proposal

11. It is proposed to amend the "Name and description" for UN 1384 SODIUM DITHIONITE in accordance with Table 1. This proposal aligns with the approach taken by this Sub-Committee and summarized in the February 2003 report (*ST/SG/AC.10/29/Add.1*)[8] on amendments to the twelfth revised edition of the UN Recommendations on the Transport of Dangerous Goods (Model Regulations). In this report, states (e.g., liquid, solid) were added to many UN-regulated dangerous goods, where the qualification as a dangerous goods or the classification may change based on the state.

Table 1: Summary of Proposed Amendments to Dangerous Goods List for Sodium Dithionite (Proposed changes in red)

UN No.	Name and description	Class or division	Subsi-diary risk	UN Packing group	Special provi-sions	Limited and excepted quantities		Packaging		Portable tanks and bulk containers	
								Packing Instruction	Special Packing Provisions	Instruc-tions	Special Provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
-	3.1.2	2.0	2.2	2.0.1.3	3.3	3.4	3.5	4.1.4	4.1.4	4.2.5 / 4.3.2	4.2.5
1384	SODIUM DITHIONITE, SOLID; or SODIUM HYDROSULPHITE, SOLID	4.2		II		0	E2	P410 IBC06	B2	T3	TP33

[8] http://www.unece.org/fileadmin/DAM/trans/doc/2003/ac10/ST-SG-AC10-29a1e.pdf