

**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**

**(Twenty-first session, 1-10 July 2002,  
agenda item 8(c))**

**LISTING AND CLASSIFICATION**

**Miscellaneous amendment proposals (Parts 2 and 3)**

**Metal Hydride Storage System for  
Hydrogen powered Proton Exchange Membrane (PEM) Fuel Cells**

**Transmitted by the Expert from Canada**

**Introduction**

1. This paper is submitted to request comments from the members of the Sub-Committee with a view to preparing a formal proposal for the December meeting if there is sufficient support to do so.
2. This paper concerns metal hydride storage systems for hydrogen powered Proton Exchange Membrane (PEM) Fuel Cells. A fuel cell converts the chemical energy of a fuel directly to usable energy without combustion. The PEM fuel cell is a device or generator that uses an electrochemical process to combine hydrogen and ambient oxygen to form water and produce electricity. It produces direct current like a battery but, unlike a battery, it does not discharge; it continues to produce power as long as fuel (hydrogen and ambient oxygen) is supplied. To obtain a level of power sufficient to operate, for example, an engine or an appliance, many separate fuel cells are combined to form a fuel cell stack.
3. While fuel cell technology is not new, the commercial use of fuel cells is still not wide spread. However, advances are being made in this field. The key to operating such a fuel cell system as a portable unit is a convenient source of hydrogen. A metal hydride storage system fulfils this requirement since hydrogen is stored in a solid metal hydride matrix at a low pressure and is released slowly.
4. Hydrogen in a metal hydride storage system is intended to be transported from a distributor to a place of use and, when the hydrogen is depleted, the storage system would be returned for refilling. It is also anticipated that portable power generating units equipped with hydrogen in metal hydride storage systems will be transported, including to remote areas.
5. Hydrogen in metal hydride storage systems presents a unique hazard not covered by any entries in the Dangerous Goods List. Hydrogen is a flammable gas while the metal hydrides are currently classified in the Model Regulations as either flammable solids or water-reactive.

6. Consequently, we would ask the members of the Sub-Committee to consider the addition to the Dangerous Goods List of the following entries that would be applied to hydrogen in metal hydride storage systems. We suggest that these storage systems should always be considered as containing hydrogen, hence the suggested shipping names, unless it can be shown that the storage system has been cleaned and purged so that a danger no longer exists. **Again, we are not requesting any action on the part of the Sub-Committee at this meeting but we are inviting comments and suggestions:**

UN No.	Name and description	Class or division	Subsidiary risk	UN packing group	Special provisions	Limited quantities	Packagings and IBCs		Portable tanks	
							Packing Instruction	Special provisions	Portable tank instruction	Portable tank special provisions
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
3AAA	HYDROGEN AND METAL HYDRIDES, FLAMMABLE, MIXTURE, in a metal hydride storage system	2.1	4.1			None	P099			
3BBB	HYDROGEN AND METAL HYDRIDES, WATER-REACTIVE, MIXTURE in a metal hydride storage system	2.1	4.3			None	P099			
3CCC	HYDROGEN AND METAL HYDRIDES, FLAMMABLE, MIXTURE, IN EQUIPMENT in a metal hydride storage system	2.1	4.1			None	P099			
3DDD	HYDROGEN AND METAL HYDRIDES, WATER-REACTIVE, MIXTURE, IN EQUIPMENT in a metal hydride storage system	2.1	4.3			None	P099			

7. We suggest for an interim period that the packaging for these substances be approved by the competent authority. As experience is gained by competent authorities in approving packagings, a packing instruction can be developed.

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