

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

5 November 2013

Forty-fourth session

Geneva, 25 November – 4 December 2013

Item 2 (c) of the provisional agenda

Listing, classification and packing: miscellaneous

Comments on ST/SG/AC.10/C.3/2013/50: Introduction of provisions for the transport of adsorbed ammonia storage systems

Transmitted by the expert from Austria

1. More details for the material used can be found in the following publication:
“A Review of Solid Materials as Alternative Ammonia
Sources for Lean NO_x Reduction with SCR
Gary Fulks, Galen B. Fisher, Ken Rahmoeller, Ming-Cheng Wu and Eric D’Herde
Delphi Corporation
Julian Tan
General Motors Corporation
Copyright © 2009 SAE International”

Download link:
<http://delphi.com/pdf/techpapers/2009-01-0907.pdf>
2. This document shows that Strontium chloride (SrCl₂) can form an Ammine
Complex: Strontium Ammine Chloride (Sr(NH₃)₈Cl₂) that decomposes on heating.

I. Adsorption or Absorption

Adsorption

3. Adsorption is the adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to a surface. This process creates a film of the adsorbate on the surface of the adsorbent. Adsorption differs from absorption, in which a fluid (the adsorbate) permeates or is dissolved by a liquid or solid (the adsorbent). Note that adsorption is a surface-based process while absorption involves the whole volume of the material. The term sorption encompasses both processes, while desorption is the reverse of adsorption. Desorption is also a surface phenomenon.
4. Similar to surface tension, adsorption is a consequence of surface energy. In a bulk material, all the bonding requirements (be they ionic, covalent, or metallic) of the constituent atoms of the material are filled by other atoms in the material. However, atoms on the surface of an adsorbent are not wholly surrounded by other adsorbent atoms and therefore can attract adsorbates. The exact nature of the bonding depends on the details of the species involved, but the adsorption process is generally classified as physisorption (characteristic of weak van der Waals forces) or chemisorption (characteristic of covalent bonding). It may also occur due to electrostatic attraction.

5. Adsorption is present in many natural physical, biological, and chemical systems, and is widely used in industrial applications such as activated charcoal, capturing and using waste heat to provide cold water for air conditioning and other process requirements (adsorption chillers), synthetic resins, increase storage capacity of carbide-derived carbons, and water purification. Adsorption, ion exchange, and chromatography are sorption processes in which certain adsorbates are selectively transferred from the fluid phase to the surface of insoluble, rigid particles suspended in a vessel or packed in a column. Lesser known, are the pharmaceutical industry applications as a means to prolong neurological exposure to specific drugs or parts thereof.

Absorption

6. In chemistry, absorption is a physical or chemical phenomenon or a process in which atoms, molecules, or ions enter some bulk phase – gas, liquid, or solid material. This is a different process from adsorption, since molecules undergoing absorption are taken up by the volume, not by the surface (as in the case for adsorption). A more general term is sorption, which covers absorption, adsorption, and ion exchange. Absorption is a condition in which something takes in another substance.

7. In many processes important in technology, the chemical absorption is used in place of the physical process, e.g., the absorption of carbon dioxide by sodium hydroxide is followed by an acid-base reaction. Therefore the overall process does not follow the Nernst partition law.

Conclusion: In this case we have to use Absorption

2. Technical description

8. The technical description is worded in a way that it seems to describe the product of a specific company, but we would prefer to have a more general approach.

3. Approach

9. In general we support the approach to exempt under certain conditions.

10. A comparison with UN 1841 Acetaldehyde Ammonia shows some similarities; especially that reaction with water, as well as the property that thermal decomposition will produce Ammonia.

11. A way forward to avoid the problem of ab- or adsorption might be a new entry for ammonia storage systems like the entry for hydrogen storage systems.

12. The risk is related to the temperature and the example of Nickel-Metal Hydride Batteries shows that in the case of higher temperature there is a risk that might be different for different modes of transport.
