UK P&I CLUB

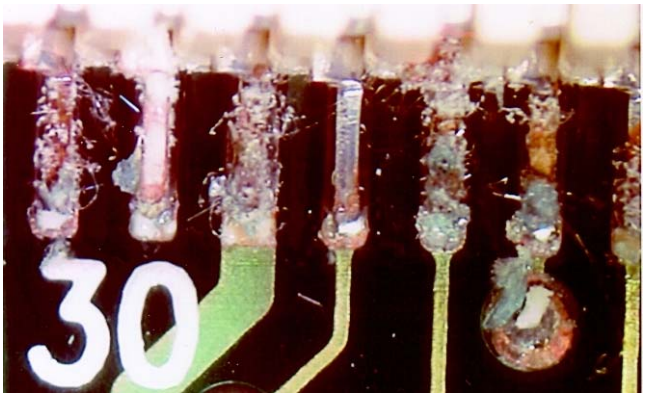
Ship Type: All **Trade Area: worldwide**

Bulletin 337 - 12/03 - Problems with Thiourea Dioxide - Worldwide

Thiourea dioxide or formamidine sulfinic acid is a white to pale yellow colourless crystalline powder used as a reductive agent in the paper industry and a bleaching agent in the textile industry. It can be produced by reacting hydrogen peroxide with thiourea.

In the period 1996/97 there were several incidents related to the decomposition of thiourea dioxide. In one incident in the Far East 400 workers were evacuated from a marine terminal and several workers were placed in hospital. At that time the chemical was not included in the IMO Dangerous Goods Code.

When exposed to heat the chemical will rapidly decompose, a reaction which may be catalysed by metal salts. This decomposition is accompanied by the release of toxic and corrosive gases including sulphur oxides, ammonia, carbon monoxide, nitrogen oxides, hydrogen sulphide etc. Sulphur oxides can further react with moisture to form acid conditions. The acid may then attack neighbouring cargo in one instance destroying a cargo of computer equipment.



Manufacturers recommend that the material should be stored in cool dry areas at ambient temperatures, away from heat sources, such as steam pipes, heating coils, heated bunker tanks.

One manufacturer states that the material decomposes at 100C but will also decompose on lengthy heating above 50C. Another manufacturer indicates that the thermal stability is 80C for two hours, the fate of the material after two hours under these conditions is not revealed.

Another safety data sheet clearly states: -

“On lengthy exposure to heat, stable up to 50C”

In the past some of the consignments were carried in ships’ holds and other consignments in containers on deck. Tests in ships’ holds indicated the temperatures in the holds in certain tropical zones reached 65C. It is safe to assume that temperatures in containers carried on deck and exposed to sunlight at the edge of a container stow may also reach 65C. Containers within the center of a stow would obviously be protected to some extent from these high temperatures.

Thiourea dioxide is now included in the IMDG Code, Class 4.2 Substances liable to spontaneous combustion, Un No 3341, Stowage Category D (On Deck Only). Various permitted packages are described under section “P002 Packing Instructions (Solids) PPI”.

Under the heading “Properties and observations” the following is included: -

“Violent exothermic decomposition above 100C with emission of large amounts of sulphur oxides, ammonia, carbon monoxide, carbon dioxide, nitrogen oxides and hydrogen sulphide. Extended exposure to temperatures above 50C and moisture may cause visible decomposition”.

Ship’s crew should be made fully aware of the possible hazards of the carriage of thiourea dioxide

Source of information: Cliff Mullins (Minton, Treharne & Davies Limited)
through the Carefully to Carry Committee