



# Carefully to Carry

## Thiourea dioxide

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 hydrogen peroxide reacting with thiourea.

During 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. Under deck stowage should be away from heat sources, such as steam pipes, heating coils, heated bunker tanks and main engine bulkheads.

One manufacturer states that the material decomposes at 100°C, but will also decompose on lengthy heating above 50°C. Another manufacturer indicates that the thermal stability is 80°C 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 50°C."

Some of the consignments were carried in ships' holds, and other consignments in containers on deck. Tests in ships' holds have indicated the temperatures in the holds in certain tropical zones may reach 65°C. 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 65°C. Containers within the centre 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*. Various permitted packages are described but under the section *P002 Packing Instructions (Solids) PPI* it states that packages should be hermetically sealed.



"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules,  
Articles iii, Rule 2

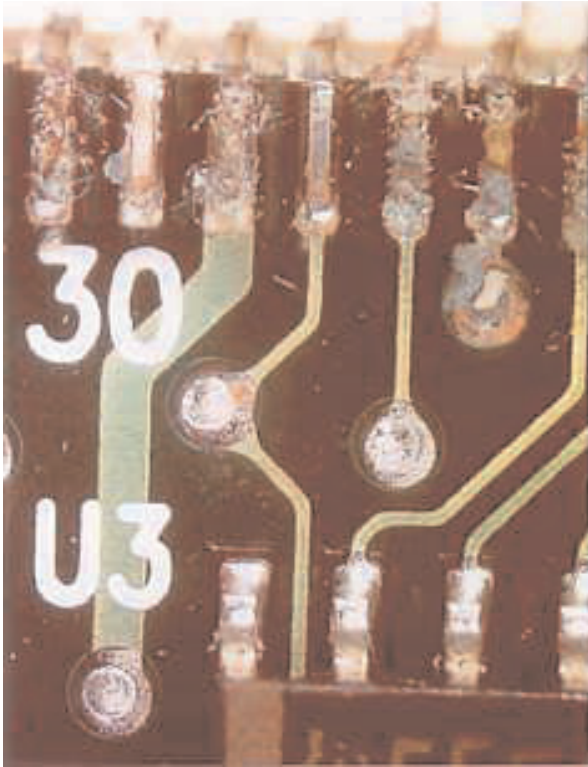
### Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website [www.ukpandi.com](http://www.ukpandi.com) for more information, or contact the Loss Prevention Department.



Under the heading Properties and observations is included the following:

"Violent exothermic reaction above 160°C with emission of large amounts of sulphur oxides, ammonia, carbon monoxide, carbon dioxide, nitrogen oxides and hydrogen sulphide. Extended exposure to temperatures above 50°C and moisture may cause visible decomposition."

Ships' crew should be made fully aware of the possible hazards of the carriage of thiourea dioxide. If stowed under deck in particular, an exothermic reaction liberating heat and toxic products of decomposition would create a difficult condition in which to undertake remedial action.