

Chemical Safety Hazard Alert - Phosgene Generated from Chloroform

Date: May 29, 2009

Lessons Learned Statement:

Phosgene can be generated from chloroform. When practicable, chloroform should be ordered with ethanol as the preservative. If chloroform is stabilized with another preservative, the age of the chloroform should be tracked, and the amount ordered should be that which can be used within one year.

Background:

Chloroform is often sold containing a preservative. This preservative is either ethanol or an alkene such as amylene or pentene. The chloroforms of primary concern are those not preserved, or preserved with the alkenes.

Prudence suggests that non-preserved or alkene-preserved chloroform bottles over one-year old be excluded from lab work. The use of ethanol-preserved chloroform is desirable because ethanol, unlike alkenes, reacts quickly with phosgene. Furthermore, more ethanol than amylene is added commercially, providing extra protection against oxidation.¹ When ordering chloroform, ask the manufacturer which preservative is used.

At a laboratory in 1998, two bottles (approx 3 years old) of chloroform, with amylene as a preservative, were found to have potentially lethal quantities of phosgene. Despite the fact that the bottles had been properly stored in the absence of heat or light, several workers had developed serious illnesses normally associated with exposure to phosgene.²

Phosgene is a colorless gas with a suffocating odor like musty hay. Brief exposures (1 to 2 minutes) to 3 ppm phosgene can cause severe lung injury, and higher concentrations can cause death from pulmonary edema. Initial symptoms of exposure include throat irritation, coughing, chest pain, nausea and difficulty breathing. Severe symptoms such as extreme difficulty in breathing may appear one to twenty-four hours after exposure.

Recommended Actions:

1. Unless program requirements prohibit it, chloroform that is stabilized with alcohol should be purchased in the future. Alcohol is usually added in greater concentration than amylene, so it provides better protection from phosgene generation. Also, there is evidence that amylene may not prevent phosgene generation.
2. Chloroform should be stored in a cool, dark place. In the presence of light, chloroform undergoes autoxidation to generate phosgene.
3. Chloroform should be treated as a time-sensitive chemical. This is especially true of chloroform that is either not stabilized or is stabilized with amylene.
4. Any bottle of chloroform that is not preserved in ethanol, and is more than one-year old should be discarded. In this case, please contact Safety and Environmental Management at 7-6913.

¹ Management of time-sensitive chemicals (II): Their identification, chemistry and management. Science Direct (Brought to you by Georgetown University Libraries) Jim Bailey, David Blair, Lydia Boada-Clista, Dan Marsick, David Quigley, Fred Simmons, and Helena White. September 16, 2004.

² Title: YELLOW - Phosgene Generated from Chloroform Identifier: INEEL Lessons Learned # 98247 - Date: May 25, 1998
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