

## **Procedures and Methods Sheet: 014**

### **Special Precautions for the Use of Hydrogen Cyanide and other Cyanides and Nitriles**

#### **Scope**

This Procedures and Methods Sheet covers the use of hydrogen cyanide, cyanogen bromide, cyanogen chloride, lactonitrile, soluble cyanides and any other substance that can generate hydrogen cyanide during a reaction.

This guidance should be read in conjunction with University of Manchester's "Guidance on the use of hydrogen cyanide, other cyanides and nitriles" available at <http://documents.manchester.ac.uk/display.aspx?DocID=12841>

#### **Hazards**

Toxicity:

1. As little as 50 – 150 mg of these compounds can cause death.
2. Accidental poisoning can occur by inhalation of mists of cyanide solutions and inhalation of cyanide gas produced by the reaction of metal cyanides with acid and water. Hydrogen cyanide is a colourless gas and these compounds do not have good warning properties so users will not be aware of gas generation.
3. Cyanide compounds are also toxic by skin absorption – concentrations of cyanide compounds of more than 2% may be fatal, with non-fatal symptoms more likely if cyanide concentration is less than this.
4. Ingestion of cyanides will also result in potentially fatal poisoning. Avoidance of skin contact is essential.

#### **Risk assessment**

1. Always first consider the use of alternative, less hazardous chemicals if at all possible. Where the use of cyanides is unavoidable, the work must be thoroughly planned and the use of cyanide compounds restricted to the minimum quantity and fewest locations for the shortest time possible.
2. Please contact the School Safety Advisor (ext. 60577, room G.029D) to discuss your planned experiment.
3. A Chemical Risk Assessment must be completed and be countersigned by both the Principal Investigator (Supervisor) and the School Safety Advisor or Deputy Safety Advisor before the work is carried out. It must include how the cyanide will be stored, used and handled and (as well as for other residues) will be disposed of.
4. All control measures identified in the risk assessment must be in place and working properly.

## **Procurement and Storage**

1. When ordering new supplies of cyanides, only order sufficient to cover the requirements.
2. Cyanides must only be stored in well ventilated, clearly labelled and locked cupboards – the key to be held by a nominated key holder. A secure storage facility is available via the School Safety Advisor.
3. An inventory of these chemicals must be kept.
4. Extreme care should be taken to ensure that cyanides are not stored with or exposed to acids.

## **Usage**

1. Work involving cyanides must only be carried out between 9.00 am and 5.00 pm Monday to Friday and no lone working is allowed.
2. Before handling any form of cyanide a first aider who is qualified for cyanide emergencies must be notified and told when, where, and for how long the cyanide will be used. A list of suitably qualified first aiders can be found in the School Safety Policy and Handbook.
3. If rescue is needed, the School Safety Advisor (ext. 60577, room G.029D) has a rescue mask that he can use to enter a contaminated area for a short period of time.
4. Procedures involving HCN gas must only be carried out after consultation with the School Safety Advisor.
5. Reactions involving other cyanides can only be carried out in fume hoods with an acceptable extract rate and good containment (face velocity  $>0.4 \text{ ms}^{-1}$ ). Notices must be displayed on the door of the laboratory and on the fume hood sash.
6. All operations, including weighing, must be carried out in the fume hood.
7. Suitable protective equipment must be worn – clean lab coat, safety glasses and impervious gloves.
8. Ensure that suitable methods of neutralisation or destruction are close at hand (see disposal section).
9. All workers in the area must be informed that cyanide is being used and a sign displayed that cyanide is in use.

## **Disposal**

1. For very small amounts of cyanides and for quick decontamination of spatulas, tissues, weighing boats etc. use an aqueous ferrous sulfate solution to complex the cyanide. This solution can also be used to safely treat small spills.
2. Any unreacted cyanide salts or residues should be solubilised in water and added cautiously to a solution of sodium hypochlorite. Care should be taken to minimise the amount of organic materials that are added to the hypochlorite due to risk of explosion. The resulting solution can be disposed of via appropriate waste stream.
3. Cyanides must not be put in waste bins or flushed down the sink even after treatment and any wastes should be disposed of properly.

## **First Aid Arrangements/In the event of an Accident**

1. Early warning signs of cyanide exposure are:
  - Irritation of eyes, nose and throat.
  - Dizziness, nausea, general weakness, headache, flushing and occasional pale skin and palpitations.
  - A feeling of suffocation followed by deep breathing, sudden unconsciousness, cessation of breathing and heart function. The breath may smell of almonds.
2. If HCN gas/vapour release is suspected or the release is not controlled, immediately evacuate the laboratory, close doors and alert the building occupants by pressing the nearest fire call point. Call for an ambulance and the Fire Brigade and inform them of the presence of cyanide and the exact location. Inform Security.
3. When dealing with a case of suspected cyanide exposure, speed of response is essential. **DO NOT PUT YOURSELF AT RISK IN ANY WAY.** Do not enter any areas if you suspect gaseous cyanide is present. The casualty will need to be rescued by someone wearing breathing apparatus (the Fire and Rescue Service). If there has been a release of HCN, anyone dealing with a casualty will need suitable respiratory protection as well as gloves and protective clothing.
4. If it is safe to do so remove the casualty to a well ventilated area (preferably outside).
5. Call for an ambulance, telling the dispatcher that the incident is a suspected cyanide poisoning and also inform University Security (69966).
6. Contact a first aider trained in cyanide poisoning treatment. This information is displayed on the building's First Aid notices.
7. Inform the School Safety Advisor (ext.60577) or Health and Safety Technician (ext.57851) at once.
8. First Aid Treatment involves maintaining the casualty's airway, breathing and circulation.

## **Inhalation**

1. Quickly remove casualty from the exposure, preferably to fresh air.
2. Keep casualty warm and at rest.
3. If the casualty is breathing, give oxygen if trained to do so (a medical oxygen cylinder is kept in room 1.075).
4. If breathing has ceased, apply artificial respiration using a bag and mask resuscitator if trained in its use. **DO NOT USE MOUTH TO MOUTH RESUSCITATION OR YOU MAY BECOME CONTAMINATED.**

**Skin Contact**

- Remove contaminated clothing immediately
- Irrigate affected area with Diphoterine® (preferred) or running water for at least 10 minutes
- Treat the casualty as for inhalation

**Eye Contact**

- Immediately irrigate with Diphoterine® eye wash (preferred) or running water for at least 10 minutes.
- Treat as for inhalation

**Ingestion**

- Do not give anything by mouth
- Treat as for inhalation

Researcher signed .....

Researcher Name .....

Supervisor Signed .....

Supervisor Name .....

Date .....