

LABORATORY SAFETY GUIDELINE

Sodium and Potassium Cyanide

All users of cyanide compounds (i.e. sodium and potassium cyanide) should review this document. Cyanides are classified as a particularly hazardous substance under the OSHA Lab Standard due to its high acute toxicity. Consequently, labs should have a written SOP. Office of Research Safety Affairs does not require acutely toxic materials to be locked up, but your lab should consider security and access controls wherever it is stored.

	Acutely toxic through skin contact, inhalation, and ingestion. Fatal if swallowed, in contact with skin or if inhaled
	Specific target organ toxicity -repeated exposure(Category 1), Thyroid
	Corrosive to metal

INTRODUCTION

Sodium cyanide is a white, water-soluble solid, that is highly toxic and exposure to eye, skin or ingestion can be fatal. The hazardous chemical takes the form of an odorless, dry powder, commonly called “dry salt”. When sodium cyanide is exposed to atmospheric moisture it produces a bitter almond-like odor.

A. PHYSICAL PROPERTIES

Compounds: Sodium Cyanide, Potassium cyanide

Mol Formula: NaCN, KCM

Molecular weight: 49.01

Boiling Point: 1497 degrees Celsius

Vapor Pressure: 1 mm Hg (817 °C)

Vapor density: 1.7 (vs air)

Solubility: H₂O: 1 M at 20 °C, clear, colorless

Flammability: Noncombustible solids; Reaction with acids liberates flammable HCN.

B. CHEMICAL PROPERTIES

Sodium cyanide is the salt of a weak acid (hydrogen cyanide, HCN), and gets easily hydrolyzed by water to form the highly toxic HCN gas. Even the solid NaCN crystals can absorb water from the atmosphere and start releasing hydrogen cyanide gas, making it highly dangerous. It also readily reacts with acids to release HCN gas.

Highly toxic; exposure by eye or skin contact or ingestion can be rapidly fatal.

C. TOXICITY

1. Skin Contact

The acute toxicity of these metal cyanides is high. Exposure to the salts or their aqueous solutions by eye or skin contact can be fatal. Symptoms of nonlethal exposure to cyanide include weakness, headache, dizziness, rapid breathing, nausea, and vomiting. These compounds are not regarded as having good warning properties. Effects of chronic exposure to sodium cyanide or potassium cyanide are nonspecific and rare.

2. Ingestion

Ingestion of NaCN can be fatal and can cause death with as little as 50 to 150 mg of exposure.

3. Inhalation

Poisoning can occur by inhalation of mists of cyanide solutions and by inhalation of HCN produced by the reaction of metal cyanides with acids and with water.

D. WORKING WITH CYANIDE

1. Preparation

Before any researcher uses cyanide compounds they should do the following:

- Read the SDS for NaCN
- Read this document and consult the references below
- Create a Standard Operating Procedure (SOP) for the process in which the cyanide is used, incorporating information contained in this document.
- Evaluate the need for a cyanide antidote kit (cyanide antidote kits small inhaled dose of amyl nitrite, followed by intravenous [sodium](#) nitrite, followed by intravenous sodium thiosulfate) and coordinate emergency response activities with Occupational Health.
- Contact the Office of Research Safety Affairs (901-448-6114) with any questions

2. Designated Area

- Assign a designated work area while working with sodium cyanide.
- Demarcate work area with warning sign while cyanide handling is in progress.
- Ensure the nearest emergency safety shower/eyewash is accessible and has been tested within the last month

3. Personal Protective Clothing

- Lab coat
- Chemical-resistant gloves (double gloving recommended)
- Safety glasses (use safety goggles and a face shield where a potential splash or dust hazard exists)
- Proper laboratory attire (e.g. long pants, close toed shoes, etc.)

4. Safe Laboratory Practices

- Working with cyanide must be done in a fume hood to prevent exposure by inhalation.
- **Do NOT work alone** when using cyanide compounds. Notify personnel in your work area prior to handling these materials. It is recommended that you limit work to normal working

hours (8:00 AM – 5:00 PM).

- Use cyanide in the minimum quantity necessary.
- Ensure the nearest emergency safety shower/eyewash is accessible and has been tested within the last month.
- Line work area with absorbent, leak proof bench pads
- Do not work alone when using sodium cyanide

5. Transporting Cyanide

If cyanide must be transported from one lab area to another:

- Place the object in a clean, chemically compatible shatter resistant container and close the lid. Use a secondary container if the first container isn't shatter resistant
- Consider putting on a single clean glove with which to carry the container, leaving an ungloved hand to open doors and handle other objects.

6. Managing Cyanide Waste

- Cyanide salts are P-listed wastes. Empty chemical containers must be collected and submitted for pick-up as hazardous waste.
- Keep separate from other waste.
- Sharps used with cyanides must be collected in a special sharps container labeled for cyanide waste.

7. First Aid

Eye:

- Immediately remove the patient/victim from the source of exposure.
- Immediately wash eyes with large amounts of tepid water for at least 15 minutes.
- Monitor the individual for signs of whole-body (systemic) effects.
- If signs of whole-body (systemic) poisoning appear, see the Inhalation section for treatment recommendations.
- Seek medical attention immediately.

Ingestion:

- Immediately remove the patient/victim from the source of exposure.
- Establish secure large-bore IV access.
- Ensure that the patient/victim has an unobstructed airway.
- Do not induce vomiting (emesis).
- Immediately administer 100% oxygen.
- Seek medical attention immediately

Inhalation:

- Immediately remove the patient/victim from the source of exposure.
- If cyanide poisoning is suspected and antidote kit is available proceed with administration in a manner agreed upon with Occupational Health.
- Ensure that the patient/victim has an unobstructed airway.
- Immediately administer 100% oxygen.
- Monitor for respiratory distress
- Seek Medical attention immediately

Skin:

- Immediately remove the individual from the exposure
- Monitor the individual for whole body effects
- Seek medical attention immediately

8. Spills or Leaks

- Do not attempt to clean up large or small spills of cyanide solutions outside the fume hood: evacuate the area, close and post all entrances to the lab prohibiting entrance
- Small spills of solutions can be cleaned up if contained in the fume hood and wearing appropriate PPE, at a minimum safety glasses, protective gloves made of PVC, nitrile or neoprene and safety glasses.
- Small spills of dry salts can be collected safely wearing appropriate PPE (same as above) using a brush and dust pan.
- Notify the Office of Research Safety Affairs to assist with cleanup

REFERENCES:

- (Stanford , n.d.)
- (Laboratory Use of Cyanide Salts Safety Guidelines, 2015)
- (Sodium Cyanide and Potassium Cyanide, 1995)