***STANDARD OPERATING PROCEDURE – C010***

**WORKING WITH PICRIC ACID**

1. **Objectives**

The objective of this document is to establish standard operating procedures for working with picric acid, ensuring the safety of laboratory personnel by mitigating potential risks associated with health, fire and explosives. Additionally, this SOP aims to enhance the efficiency of experimental workflows.

1. **Personal Protective Equipment**

To ensure safety during work with picric acid, appropriate personal protective equipment (PPE) must be worn. This includes:

* Long pants and closed-toe shoes to protect against spills and splashes.
* A long-sleeved, buttoned lab coat to minimize skin exposure.
* Safety glasses or goggles to protect against splashes or flying debris.
* Disposable nitrile/neoprene gloves to prevent direct contact with hazardous chemicals.
	+ **NOTE:** The chemical’s SDS should always be checked prior to start of work to ensure proper glove selection.
* If the user has long hair, it should be tied back.
1. **Potential Hazards & Safety Precautions**

When working with picric acid, safety precautions must be taken to manage and maintain a safe working environment. There are several hazards a user can come into contact with and these include:

* **Health hazard:** Picric acid is toxic if swallowed, inhaled, or absorbed through the skin. Inhalation of dust may cause lung damage. Swallowing picric acid may cause a bitter taste, headache, dizziness, nausea, vomiting, and diarrhea. High doses may cause destruction of the red blood cells and damage to the kidneys. Skin absorptions will likely cause staining of the skin, and that picric acid is also a skin sensitizer and can induce an allergic response following skin contact. Chronic exposure may cause liver or kidney damage. It is irritating to the skin and eyes.
* **Explosive hazard:** Picric acid is typically sold moisten with at least 30% water for safety purposes. As the water evaporates over time, the substance becomes dry picric acid crystals. Dry picric acid is a Class 1 Explosive and highly sensitive to heat, shock and friction. Picrate salts of heavy metals such as copper, zinc, iron and lead are even more sensitive than picric acid itself. It will also react with alkaline materials including plaster and concrete to form explosive materials. Rapid decomposition generates nitrogen, carbon dioxide, water, and other toxic substances.

Where possible, always substitute and use less hazardous materials.

1. **Training**

Ensure all personnel have received proper training on their hazards and safe handling techniques.

* MC03 Chemical Safety II / Hazardous Waste Management
* MC07 Chemical Safety I / Chemical Safety for Laboratory Users
1. **Procedures**
2. Storage and handling
* Do not store a large amount of picric acid. Dispose of picric acid stocks that are more than two years old. Also, dispose of all old picric acid bottles with metal caps.
* Use extreme caution with such containers that still contains picric acid.
* Keep container tightly closed and in a cool dry well ventilated area.
* Minimum amount of picric acid should be acquired in laboratories for manipulations.
* Label all picric acid with date received.
* Picric acid forms sensitive salts with, and is therefore incompatible with: alkalis, transition metal oxides and alkaline salts, and heavy metal oxides. Iron, nickel, copper, zinc, lead, and mercury compounds are specifically mentioned in various reports, but manganese, cobalt, palladium, silver and cadmium compounds should be suspected as well.
* When possible, purchase picric acid in solution. If you must purchase it as a solid make sure that it is sold moistened (not as a dry solid).
* Do not use a new bottle until the old picric acid is used completely.
* Make sure any stored picric acid IS KEPT WET.
* Clean bottle neck, cap and threads with a wet cloth before re-sealing.
* Don’t allow picric acid come in long-term contact with metal surfaces. Remember, many metal picrates are much more sensitive to potential explosion than picric acid, itself.
* Never put picric acid in a metal container or use metal (unlined) lids.
* **Do not use metal spatulas** when manipulating picric acid. Wooden and plastic spatulas are safe to use.
* Check the hydration of picric acid as part of regular laboratory inspection and add distilled water if needed to maintain a wet paste (minimum 30% water by volume).
* Label the containers to show the date when they are opened.
* Maintain a log for regular inspection of containers, usage, and the dates of receipt and opening.
* Keep inventories of picric acid low and contact the HSEO for pick-up of unwanted chemicals.

IMPORTANT: Contact HSEO immediately if you come across any bottles containing dehydrated picric acid. Do not handle.

1. Disposal of picric acid
* Picric acid should be collected in a sealed container as an aqueous solution and disposed of as a hazardous waste within 2 years of initial receipt. Follow the SOP titled “Disposal of hazardous chemical waste” for more details.
* Check waste log sheet to avoid disposing in container containing incompatibles: alkalis, transition metal oxides and alkaline salts, and heavy metal oxides. Iron, nickel, copper, zinc, lead, and mercury compounds are specifically mentioned in various reports, but manganese, cobalt, palladium, silver and cadmium compounds should be suspected as well.
* Labpack Waste Scheme is not available for picric acid disposal.
1. **Spills, Incidents and Reporting**
* For picric acid powders: First ensure that the material is moist. If necessary apply water to the powder (misting it if possible). This will reduce dust formation and make it safe to handle. Keep misting during the clean-up process. Do not sweep up. Use a dampened absorbent pad to remove the material off the floor.
* All surfaces can be cleaned with a soap solution followed by alcohol. Collect all picric acid and the spill materials into a glass jar for disposal purposes (avoid containers with metallic caps). If necessary a plastic pail with a lid can be used. Contact HSEO for pick-up.
* In the event of a fire, activate the fire alarm and evacuate the area. Do not activate the emergency ventilation system, as they can exacerbate combustion.
* Skin Exposure (spill on hands): Wash hands thoroughly with soap and copious amounts of water. Notify supervisor immediately.
* Skin Exposure (spill on body or clothes): Remove affected clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Remove jewelry or clothing as necessary to facilitate cleaning of any residual material. Seek medical attention. Notify supervisor and HSEO immediately.
* Eye Exposure: Immediately rinse eyes and inner surface of eyelid with water for 15 minutes while holding the eye open. Seek medical attention. Notify supervisor and HSEO immediately.
* Inhalation: Move person into fresh air if picric acid is breathed in. Consult a physician.
* Ingestion (Swallowing): Rinse mouth with water. Never give anything by mouth to an unconscious person. Seek medical aid.
* Report any accidents that result in injuries to the PI and/or the departmental safety officer (DSO) immediately.
* For serious incidents, notify the Security Unit immediately by calling the 24-hour hotline on **2358 8999**.
1. **References**
* Louisiana State University Health Sciences Center. (2018). *Standard operating procedures for the safe use of picric acid (2,4,6-trinitrophenol)*. https://www.lsuhsc.edu/admin/pfm/ehs/docs/Picric%20Acid.pdf
* University of Tennessee Health Science Center. (2019). *Guidelines for the safe handling of picric acid*. <https://www.uthsc.edu/research/safety/documents/sop-picric-acid.pdf>
* Health, Safety and Environment Office, The Hong Kong University of Science and Technology (n.d.). *Appendix 8B - Hazardous Chemical Storage Precautions*. Retrieved on June 26, 2025, <https://hseo.hkust.edu.hk/sm_08_8B>
* Health, Safety and Environment Office - Hong Kong University of Science and Technology(n.d.). *Laboratory Emergency Preparedness and Response Video*, from <https://hseo.hkust.edu.hk/node/3653>
* Health, Safety and Environment Office, The Hong Kong University of Science and Technology (n.d.). *Safety Alert – The Anhydrous Picric Acid*, from <https://hseo.hkust.edu.hk/system/files/documents/202307-Safety_alert.pdf>