1 Introduction

This document offers a short and concise overview of toxic chemicals. Understanding the following content is a crucial prerequisite in understanding basic safety fundamentals such as 1) hazard awareness, 2) engineering controls, 3) work practices, 4) PPE and 5) emergency response for working with toxic chemicals.

2 Scope

The guideline applies to lab personnel, and it has been developed to assist them in the preparation of lab specific SOPs.

3 Procedure

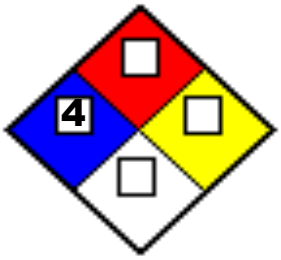
3.1 Introduction to Toxic chemicals

Exposure to even small amounts of highly toxic and toxic chemicals used in the research laboratory can cause serious injury and even death. Because of their high acute toxicity, all handling of toxic compounds must be controlled through good experimental design, active supervision and thorough training on the lab specific Standard Operating Procedures (SOPs) for these materials. Failure to follow proper handling procedures can expose research and/or support staff to dangerous chemical compounds.

Before working with highly hazardous toxic chemicals, lab workers should be trained on the proper lab specific procedures (SOPs). The written SOPs must include detailed information on how to do the work safely. The safety information in this document can assist with the development of an SOP specific to the laboratory procedure.

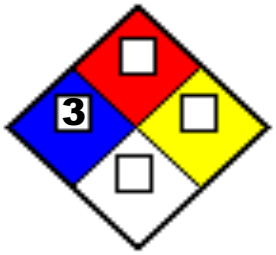
Examples of Highly Toxic/Toxic Chemicals Used in Research Labs:

- Highly Toxics: Solid or liquids having a lethal dose (LD_{50}) of less than or equal to 50 milligrams per kilogram body weight. Generally these compounds have a NFPA Health Hazard rating of 4. Examples include: arsenic trichloride, sodium cyanide, sodium azide, dimethylmercury, and di-isopropyl fluorophosphate.



Highly toxic chemicals generally have health hazard rating (blue) of 4.

- Toxics: Solids or liquids having a lethal dose (LD_{50}) between 50-500 milligrams per kilogram body weight. Generally these compounds have a NFPA health hazard rating of 3. Examples include: phenol, aniline, benzene, carbon disulfide.



Toxic chemicals generally have health hazard rating (blue) of 3.

3.2 Controlling the Hazards

- Substitute less hazardous chemicals if possible to avoid working with toxic substances and keep exposures to a minimum.
- Minimize the quantities used and stored in the laboratory. Use only the least amount required, and as dilute of a solution as possible.
- Plan your experiment out in advance, including layout of apparatus and chemical and waste containers that are necessary.
- Before working with any toxic substance, review chemical resources for any special decontamination or deactivation procedures and ensure you have the appropriate spill cleanup materials and absorbent on hand.
- When not in use, toxic chemicals shall be securely stored in closed, locked cabinets. Segregate toxic chemicals from other hazard classes.
- All toxic chemicals shall be included in the laboratory's chemical inventory.
- Laboratory door signage shall indicate the presence of toxic materials inside the lab.
- Access to the laboratory or work area shall be restricted when work with toxic chemicals is in progress.

3.3 Ventilation

- To control toxic chemicals, they should be handled inside a chemical fume hood (or other suitable ventilated containment device). Fume hoods generally provide effective containment and are the preferred ventilation device. Before use, always check to be sure the fume hood is certified and working properly.
- Do not work with highly toxic chemicals outside of a fume hood, glove box or ventilated enclosure.
- Prevent contamination of the fume hood work surface by placing plastic spill trays or disposable bench paper on the work surface before starting work.
- Do not use toxic chemicals inside cold rooms or other areas that have recirculating atmospheres.

3.4 Personal Protective Equipment

- Gloves carefully selected based on the hazard, shall always be worn when handling these chemicals. Be sure to review glove permeability ratings provided by glove suppliers. Double gloving is strongly encouraged while handling toxic chemicals. Wash reusable gloves before

removal. Carefully remove gloves to avoid contaminating hands. Wash hands and arms immediately after working with these materials.

- Lab coats shall be worn when handling toxic chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely. Lab coats shall not be taken outside the lab to offices or administrative areas. Lab coats shall be cleaned using the University laundry service – they must not be taken home.
- If the chemical fume hood is used properly, respiratory protection devices are not likely necessary. If you think you need to wear a respirator, contact HSE at hse@kaust.edu.sa for more information. Dust masks provide no protection from vapors or gases.

3.5 First Aid and Emergencies

- Review the Safety Data sheet to be aware of first aid and emergency procedures. Be aware of any special antidotes that may be required in case of accidental exposure (phenol and inorganic cyanides for example). Anticipate spills by having appropriate spill supplies readily available.

3.6 Disposal

- All materials contaminated with toxic chemicals should be disposed of as a hazardous waste. Do not dispose of items contaminated with toxic materials in the regular trash.

4 References

- OSHA 3404-11R (2011) – Laboratory Safety Guidance
- KAUST Laboratory Safety Manual
- HSE-RST-Chem001M – Chemical Safety Program

5 Help

Questions about this guideline? Contact: hse@kaust.edu.sa