

Environmental Health and Safety

The goal of the Chemical Hygiene Plan is to protect students, staff, and visitors from potential health hazards associated with the handling, use, and storage of hazardous chemicals in teaching and research laboratories.

- b. Emergency Response Information
 - i. Any emergency
 - a. For any emergency, dial 911 or University police at 373-2234.
 - ii. Non-Life-Threatening
 - a. If circumstances allow calling without endangering human life, notify University Police at 373-2234.
- c. Safety Contacts

flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

- x Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.2079 (ASTM D 569)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or
- x PenskyMartens Closed Tester (See American National Standard Method of Test for Flashpoint by PenskyMartens Closed Tester, Z11.7979 (ASTM D 939)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
- x Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D-3879))
- x Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above

Hazardous chemical-

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory Use of Hazardous Chemicals Laboratory use of hazardous chemicals means handling or use of such chemicals in which all of the following conditions are met:

- x Chemicals are handled in the course teaching or research activities;
- x Multiple chemical procedures or chemicals are being used;
- x Protective laboratory practices and equipment are available and in common use to minimize the potential exposure to hazardous chemicals.

Medical Consultation A consultation between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

SDS (Safety Data Sheet) Safety Data Sheet, document providing both workers and emergency personnel with the proper procedures for handling chemical(s) described by that document.

Organic Peroxide An organic compound that contains the bivalent O-O structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

OSHA: Occupational Safety and Health Administration. Refer to 29 CFR 1910.1450 for the OSHA Laboratory Standard.

Oxidizer Chemical, other than a blasting agent or explosive as defined in § 1910.109(a), that is at

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Reproductive toxins Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select Carcinogen Any substance which meets one of the following criteria:

- x It is regulated by OSHA as a carcinogen; or
- x It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or
- x It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or
- x It is listed in either Group 2A or 2B by IARC or under the category, "reasonably

exposed skin covered (arms, legs, feet) and will not wear shorts, tank tops, etc. Students will wear a lab apron or lab coat when handling hazardous chemicals.

- ii. Garments contaminated with hazardous materials:
 - 1. Do not remove garments contaminated with hazardous materials from the building for laundering. Personnel shall remove potentially contaminated personal protective equipment (gloves, lab coats, etc.) prior to leaving the laboratory and handle it appropriately to prevent the potential spread of contamination outside the laboratory or building.
- iii. Gloves
 - 1. Personnel will wear gloves of appropriate material when the potential for contact with toxic or corrosive materials exists.

avoid the intake of contaminated air whenever possible. Vent vacuum pumps, distillation columns, chromatographs, etc., which may discharge toxic amounts of hazardous chemicals, into a local exhaust or chemical fume hood system whenever possible.

b. Laboratory Fume Hoods

- i. Provide adequate hood space for persons working with hazardous chemicals. Verify that the hood exhaust system is working before using a hood. For example, attach a simple "flow indicator" (strip of tissue about 1" wide and at least 4" long) with tape to the bottom of the hood sash. Always work at least six

- i. Inspect all equipment regularly for wear and deterioration. Repair or replace all defective equipment prior to further use. Maintain a written log of equipment inspections. Inspect equipment and facilities regularly and insure that necessary maintenance is performed. Develop an adequate lockout system to prevent injury from equipment during maintenance procedures. If applicable, coordinate maintenance operations and logshwifacilities.
 - b. Fume Hoods
 - i. EHS or an approved vendor will check fume hoods. Fume hoods will be checked at least once a year as well as following installation, filter changes, or maintenance activities. The check should include measuring the air velocity by making a traverse with an anemometer or velometer in the face plane of the hood with the sash at the practical work opening width. The average should be at least 100 linear feet per minute and the velocity at each point should not vary by more than 15 percent from the average.

VII. Guarding and Shielding

- a. Provide adequate guards for all mechanical equipment such as vacuum pumps, heating mantles, and centrifuges, to prevent access to electrical connections or moving parts. Use safety shielding for any operation having the potential for an explosion or to minimize exposure. 1 (e)-6.6 (s)-1.3 4.2 (r)11 (m)p nt fro 1x ure a travt frl6. -1ea bt7 Td nt7 Td n(

- g. When volatile materials are present, use only non-sparking explosion-proof electrical equipment such as explosion-proof refrigerators.

X. Explosive Hazards

a. Organic Peroxides

- i. Organic peroxides, as a class, are ~~low~~ power explosives that are hazardous because of their extreme sensitivity to shock, sparks, or other forms of accidental ignition.
- ii. All organic peroxides are highly flammable, and fires involving peroxides should be approached with extreme caution.
- iii. Use only the smallest amount of peroxides possible.
- iv. Date all chemicals when received and dispose of old chemicals in accordance with the TTU Hazardous Waste Management and Satellite Accumulation Area Guide
- v. Clean up all spills immediately by adsorbing onto vermiculite. The sensitivity of most peroxides to shock and heat can be reduced by dilution with inert solvents such as aliphatic hydrocarbons.
- vi. Avoid solutions of peroxides in volatile solvents since solvent vaporization might lead to increased peroxide concentration.
- vii. Use ceramic or wooden spatulas, never metal, to handle peroxides. Avoid friction, grinding and all forms of impact near peroxides (especially solid ones).
- viii. Do not use glass containers that have ~~esc~~ cap lids or glass stoppers. Polyethylene bottles that have screw caps may be used.
- ix. To minimize the rate of decomposition, store peroxides at the lowest possible temperature but not below the temperature at which the peroxide freezes or precipitates.
- x. Peroxides in solid form are extremely sensitive to shock and heat.
- xi. Perform all laboratory experiments employing peroxides or peroxide containing solvents behind a shield and with all other recommended precautions.

b. Picric acid

- i. Picric acid with <10% water presents a potential explosive hazard. Damp picric acid is white; dry picric acid is yellow. Handle dry (yellow) picric acid bottles with extreme caution.
- ii. Check all supplies of picric acid monthly for color and add water as necessary. Limit the amount of acid to minimum required.
- iii. Maintain a record of the date of receipt of the supply and properly dispose of unused acid before it degrades with time to an unsafe condition.
- iv. Label all storage areas and containers to indicate ~~the~~ contents and caution against disturbing.
- v. Do not store acid in proximity with materials such as oxidizable materials, metals (particularly finely divided) and alkaloids.
- vi. Store containers in a ~~well~~ secured area equipped with adequate ventilation. Avoid excessive movement or concussion of picric acid containers.
- vii. Wear appropriate protective equipment when handling the acid to include chemical gloves, laboratory aprons, eye protection, etc.

- viii. Do not open a container if the acid appears dry. If crystals have formed over each other, this may indicate sufficient dryness to be hazardous.
 - ix. Do not attempt dilution of acid unless through familiarization of the safe procedure to be applied has been performed.
 - x. Picric acid is a corrosive material that requires standard acid handling safety precautions.
 - xi. Spills of picric acid must be properly cleaned up as soon as possible and the residue properly disposed.
 - 1. If a spill occurs in the sink, flush with copious amounts of water. If the spill is on the counter or floor cover with sand/soda ash mixture.
 - 2. To clean glassware and equipment contaminated by picric acid, thoroughly wash with a mild bicarbonate solution, followed by a strong soap solution. Regard empty, cleaned containers and equipment as regular waste material.
 - 3. Additional training and documentation is required for work with picric acid. Review the [Guidelines for Work with Picric Acid](#)
- c. Perchloric Acid
- i. Perchloric acid solutions in contact with oxidizable or combustible materials or dehydrating and reducing agents may result in fire or explosion.
 - ii.

- i. In general, compounds containing the following functional groups tend to be sensitive to heat and shock:

Acetylide	Nitroso
Azide	Ozonide
Diazo	Peroxide

- i. Ground cylinders containing flammable gas and bond them to the equipment they serve to control static electricity
- f. Size and total number of cylinders
 - i. Keep both the size and number of cylinders present as small as possible. Toxic, flammable and corrosive gases should be used with local exhaust ventilation (such as a fume hood) whenever possible
- g. Traps or suitable check valves
 - i.

XIII. Ionizing Radiation Hazards

- a. Post appropriate signage at each entrance to an area containing an ionizing radiation source(s). Follow established guidelines/standards regarding the storage, use and management of radioactive material and restrict such activities to approved areas. .3 (re)-3 (s2.

Others

Phosphorus pentoxide (P ₂ O ₅)	Calcium carbide (CaC ₂)	Organic acid halides and hydrides of low molecular weight
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Alkali Metals

Sodium (Na)	Potassium (K)	Metal Powders (Particularly when finely divided)	Aluminum (Al)
Cobalt (Co)	Iron (Fe)	Magnesium (Mg)	Palladium (Pd)
Platinum (Pt)	Tin (Sn)	Zinc (Zn)	Zirconium (Zr)

Others

White Phosphorus

XV. Safety Equipment and Procedures

a. First Aid

- i. All accidents involving an injury need to be reported to your supervisor. Please review TTU Human Resources procedures for documentation of accidents involving students, visitor, staff, and faculty.
- ii. It is recommended, but not required to keep adequate first aid supplies in each teaching laboratory that contains or uses hazardous chemicals
- iii. Immediately flush chemicals burns with copious amounts of water for at least 15 minutes.
- iv. All laboratory personnel and students shall have access to emergency equipment, a fire alarm, and telephone for use in an emergency.

b. Personal Protective Equipment (PPE)

- i. Wear a lab coat, eye protection, gloves, respirators, etc. as appropriate for the degree of hazard present in the laboratory.

- ii. Refer to the SDS for the chemical being used for specific PPE requirements.

iv. Provide safety showers in areas that utilize hazardous chemicals or materials/equipment which might require drenching to remove the hazard from an individual

1. The exemption of the requirement for having a safety shower is if the safety shower is located in an area where the overall hazard of the laboratory work is increased by a factor of 10 or less (e.g., 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000).

1. All personnel will use HEPA filtration to protect fume hood exhausts, vacuum lines, etc.; decontaminate the area after use; and dispose of waste per instructions from the TTU Hazardous Waste Management and Satellite Accumulation Area Guide
- iv. Pregnant women ~~ms~~ consult with their personal Physician prior to working with mutagens or teratogens.
- b. Chemicals of High Chronic and Acute Toxicity
 - i. Chemicals of high chronic toxicity will show delayed, usually irreversible effects after repeated exposure, while chemicals of high acute toxicity will show quick, sometimes reversible effects after a single short exposure. Use these chemicals in a controlled access laboratory.
 - ii. Decontaminate any equipment before removing it from the laboratory or dispose of it as hazardous waste. Refer to the Surplus Disposal Guide for additional information. Remove and dispose of protective clothing when leaving the laboratory.
- c. Carcinogens
 - i. Follow all precautions outlined in Safety Data Sheet (SDS) when working with known or suspected carcinogens.
- d. Teratogens and Mutagens
 - i. Teratogens and mutagens can affect a developing embryo or fetus or adversely alter the DNA of an exposed person. Common chemicals suspected of being mutagens and teratogens include:

Benzene	Vinyl Chloride	Hydrogen Sulfide	Toluene
Formaldehyde	Carbon Disulfide	Xylene	Dimethylformamide

3. Chemical in the container is removed, a new type of chemical is placed in the container, and the container relabeled with the identity of the new chemical.
- e. Special Labeling Practices
- i. Research samples and chemicals developed in the lab (samples) must be managed responsibly. Samples often accumulate in labs for years and are difficult to identify and dispose of and can create unsafe and non-compliant conditions if not managed properly.
 - ii. If you transfer the chemical into a secondary container and do not use it immediately, it must be labeled with:
 1. The required information from the original container label OR product identifier AND general information regarding the chemical hazards that, together with other information available, will provide employees with 3 ()fhT.5inS3.13 0 Td (t)Tj-3.1 ()7.9 (m50 Td (13.6 (th)5 0.304 0

c. Students insn3.8 (29.5 t)0.6 (s)9.5 i.l b(29.5 (n3.8 g(298.7i)1)-8.7v(s)]5.9 (n3.8 (29.5 b(1 B (3 (
