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Handling, Storage and Disposal of Hazardous, Time Sensitive, and Expired Chemicals

1. OBJECTIVE & GENERAL



- 1.1. This procedure describes methods for safely handling, storing and disposing of hazardous, time sensitive and expired chemicals. The procedure aims to minimize risks to personnel and property and ensure continuing legislative compliance.
- 1.2. It is applied to all Weizmann Institute of Science (WIS)'s laboratories and supporting units that use hazardous substances (chemicals) which are prone to be a physical hazard (flammables, explosives, oxidizers, etc.) and/or health hazard (allergens, carcinogens, irritants, etc.) and are under the regulation of both the Ministry of Environmental Protection Department and the Home Front Command Department that regulate a list of hazardous substances.
- 1.3. These chemicals are under the Hazardous Substances Law (1993) regulations, therefore, a hazardous materials permit is required for the WIS institute for any chemical, whether the substance is in its simple form, mixed, or blended. This Permit specifies the types, quantities and compositions of chemicals allowed in the different facilities in the WIS. Once in two years, the WIS is inspected by both authorities mentioned in 1.2 in order to obtain a valid hazardous materials permit for WIS's chemical activities. This authorization is under the responsibility of the Safety Hazard Officer from the WIS Safety Unit.

2. 2. APPLIED TO:

- 2.1. All PIs working with chemicals in the WIS's laboratories.
- 2.2. All students and lab members working with chemicals at WIS.

3. USING OF HAZARDOUS SUBSTANCES

- 3.1. A hazardous substance shall only be brought into WIS campus from any source (procurement, donation, etc.) after obtaining written permission from the safety unit or via the procurement system of the safety hazard officer.
- 3.2. **It is prohibited** to work with a substance that is not included in the valid hazardous materials permit as described in 1.3 (see reference 11.1 for list of substances).
- 3.3. A threshold condition for the issue of the written permission shall be in compliance with the hazardous materials permit of WIS or pursuant to a special permit from the

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Ministry of Environmental Protection accompanied with the application's relevant MSDS.

- 3.4. The hazardous substances that are invalid or do not match the authorized order will not be used.
- 3.5. Exchange and transfer of hazardous substance/s between WIS's laboratories must be monitored by informing the safety unit and receiving a written permission.


4. HAZARD DESCRIPTION

4.1. Time Sensitive Chemicals (TSC's) are any chemical or chemical product that develops additional hazards upon prolonged storage. Examples of these chemicals include peroxidizables (e.g. Diethyl ether), peroxides (e.g. Benzoyl peroxide), polynitrated aromatics (e.g. Picric acid), Chloroform, strong acids, and compressed gas cylinders. Additional Information for these examples:

- 4.1.1. Peroxidizables are oxygenated organic compounds that will react with atmospheric oxygen to form explosive peroxides.
- 4.1.2. Peroxides are any chemical compound in which two oxygen atoms are linked together by a single covalent bond (R-O-O-R). Benzoyl peroxide is an organic peroxide which under dry condition may explode if exposed to heat, shock or friction.
- 4.1.3. Polynitrated aromatics are aromatic compounds containing at least two nitro (-NO₂) functional groups attached directly to a benzene ring (e.g. Picric acid, Picrate salts, Dinitrophenols). Under dry condition, the chemicals are sensitive to shock and friction and may explode.
- 4.1.4. Chloroform will react with air in the presence of light over time to form Phosgene (very toxic gas). Chloroform is suspected to cause cancer.
- 4.1.5. Valid hydrostatic test is critical when it comes to compressed gas cylinders because they can explode if damaged in time by corrosion.
- 4.1.6. Since there may be others, review the Material Safety Data Sheet (MSDS) for any specific compound that is being used to find out if it is a time sensitive chemical.

5. SPECIAL PRECAUTIONS AND CONTROL



5.1. Time-sensitive materials **should be monitored** in the laboratory and properly disposed at regular intervals. If these materials are left in storage long enough to form hazardous by-products or get dried (drying in time of solids moistened with water), their management and disposal becomes increasingly hazardous and costly.

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- 5.2. If you discover a time-sensitive materials that have expired, do not touch the bottle!
- 5.3. Visually inspect the bottle for product identification and expiration date.
- 5.4. Never, under any circumstances, touch or attempt to open a container of peroxide-forming liquid if there are whitish crystals around the cap and/or in the bottle.
- 5.5. The same for expired moisturized solid TSM's (e.g. Picric acid and Benzoyl peroxide), the friction of unscrewing the cap could detonate the bottle. In both cases, secure the area with a warning note ('DON'T TOUCH, AN EXPLOSIVE') and notify immediately the safety unit (08-9343844) so that they manage the disposal.
- 5.6. Purchase the smallest quantity that is practical for time-sensitive materials. Substitution with less hazardous materials or purchase them as dissolved in diluted solution is highly preferable (e.g. instead of as moisturized shock sensitive solids).
- 5.7. As mentioned above, old, expired time-sensitive chemicals must be disposed of from the laboratory. **Yet, as a rule, disposal of any outdated and expired material in the laboratory is mandatory in order to prevent unnecessary accumulation of chemicals, additional physical/health hazards and even effects on your research results (due to some extent of degradation). Prominent examples are: acetylenic compounds, perchlorates, azides, organic acid halides and anhydrides, Sodium/Potassium metal, and thiols.**
- 5.8. All hazardous chemicals must be stored in a safe manner according to the law and WIS's requirements. Chemical storage areas must be clearly labeled and marked, and all chemicals (and waste) must be segregated according to hazard classes.

6. PEROXIDIZABLES

- 6.1. Examples for these materials are Acrylic acid, Vinyls, Butadiene, Ethers, Methoxys, Ethoxys, 2-Butanol, 2-Propanol, Tetrahydrofurane and Dioxane.
- 6.2. These materials should be dated, tested and disposed of within twelve months of opening or receipt.
- 6.3. Make sure that the purchase of these materials contains an appropriate peroxide inhibitor, such as butylated hydroxytoluene (BHT). If non-inhibited material must be stored, be sure to store the material under an inert atmosphere of nitrogen or argon and test it for peroxides at least once a month (using Peroxide test strips).
- 6.4. Do not distill, evaporate or concentrate the material until you have first tested the material for the presence of peroxides. Peroxides are usually less volatile than their parent material and tend to concentrate in the distillation flask.
- 6.5. NOTE: Never, under any circumstances, touch or attempt to open a container of peroxide-forming liquid if there are whitish crystals around the cap and/or in the

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bottle. The friction of unscrewing the cap could detonate the bottle with disastrous results.

7. POLYNITRATED AROMATICS (e.g. PICRIC ACID / 2-, 4-DINITROPHENOLS) AND PEROXIDES (e.g. BENZOYL PEROXIDE)

- 7.1. Picric acid, its derivatives and Benzoyl peroxide should be stored in small quantities, within the original container and in a cool, dry, well-ventilated area that is away from sources of heat.
- 7.2. Purchase of Picric acid is allowed only as dissolved in diluted solution instead of as moisturized solid. Purchase of moisturized Benzoyl peroxide (min 25% H₂O) requires a written permission from the safety unit.
- 7.3. Picric acid is considered a flammable solid and is incompatible with oxidizers, reducing agents, inorganic salts, metals, alkaloids and albumin.
- 7.4. Improperly managed or stored Picric acid may become sensitive to shock, friction, and heat.
- 7.5. Moisturized Picric acid and Benzoyl peroxide allowed to dry out to less than 10% and 3% water by mass, respectively, become unstable and may pose an explosion hazard. If the materials appear dry or crystalline or have expired, do not open or handle the container – immediately contact the safety unit (08-9343844).
- 7.6. Picric Acid and Benzoyl peroxide must be disposed of before their expiration dates and within two years of receipt.

8. CHLOROFORM

- 8.1. Chloroform (CHCl₃) should be stored in a cool, dry, well-ventilated area (less than 30 degrees C) and in tightly sealed container/bottle.
- 8.2. Chloroform decomposes at normal temperatures in sunlight in the absence of air, and in the dark in the presence of air.
- 8.3. Detection: Chloroform will have a normal appearance. The only way to determine level of decomposition is by determining the age of the material by the lot number or opening date marked on the container.
- 8.4. Phosgene gas (COCl₂) is a decomposition product of Chloroform. Phosgene exposure can cause damage to the central nervous system in concentrations at only a small fraction of the permissible exposure limit of Chloroform.
- 8.5. If possible, Chloroform that is stabilized with alcohol should be purchased.
- 8.6. If non-stabilized Chloroform is necessary for the work, it needs to be used up or disposed in a short period of time (3 months).

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8.7. Stabilized Chloroform should be disposed of after it has been open for longer than one year.

9. TIME-SENSITIVE COMPRESSED GAS CYLINDERS

9.1. Over time, the moisture that may slowly enter the cylinder, its effect on the exterior parts, and in case of a corrosive gas, initiate corrosion. As the corrosion continues, the walls of the cylinder weaken and ultimately, these cylinders fail and create extremely dangerous projectiles and gas release. Therefore, a laboratory or department are forbidden to keep in the laboratories/WIS a cylinder gas whose **hydrostatic test** is not valid. A hydrostatic test is a way in which pressure vessels such as pipelines, plumbing, gas cylinders, boilers and fuel tanks can be tested for strength and leaks. The test involves filling the vessel or pipe system with a liquid, usually water, which may be dyed to aid in visual leak detection, and pressurization of the vessel to the specified test pressure.

9.2. In accordance with Israeli Standards 712, all compressed gas cylinders have to be hydrostatically tested every:

- Inert gases, inflammable and flammable gases: 10 years
- Toxic gases: 5 years
- Corrosive gases: 3 years

10. RECORD KEEPING

10.1. All chemicals shall be listed on the lab's chemical inventory. Time sensitive chemicals shall also be dated on the inventory.

10.2. The chemical inventory shall be reviewed annually.

11. REFERENCES AND ADDITIONAL INFORMATION

11.1. WIS's hazardous materials permit (version 2024-2026) - as Appendix 2.

11.2. Hazardous Substances Law (1993):


https://www.gov.il/he/pages/hazardous_law_1993

11.3. Florida State University, Management of time-sensitive chemicals:

https://safety.fsu.edu/safety_manual/supporting_docs/Management%20of%20Time%20Sensitive%20Chemicals%202.pdf

11.4. The University of Tennessee, Time-Sensitive Chemicals:

<https://ehs.utk.edu/index.php/table-of-policies-plans-procedures-guides/time-sensitive-chemicals/>

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11.5. University of Alberta, Chemical Storage Guidelines:

https://docs.google.com/document/d/19cGuTxEQWMFxIAa37_DHKw6CcfLwB3cu2PVEINRJ3xU/edit

11.6. Wayne State University, Chemicals Not to Be Given Away to Other Labs:

<https://research.wayne.edu/oehs/hazardous/do-not-inherit-chemicals>

11.7. University Of Notre Dame, Standard Operating Procedure for Handling Storage and Disposal for Time Sensitive Chemicals:



https://riskmanagement.nd.edu/assets/444907/storage_and_disposal_of_time_sensitive_chemicals.pdf

11.8. Ariel University, Work safety with Hazardous Substances:

<https://www.ariel.ac.il/wp/safety/wp-content/uploads/sites/124/2023/06/Work-safety-with-Hazardous-Substances.docx>

12. TABLE OF VERSIONS AND REVISION HISTORY

Document No.	Version	Date	Changes and Updates	Signature
WIS000006	01	25/06/2024	First version	Dr. Itzhak Ergaz



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Appendix 1:


Rules for Handling, Storage and Disposal of Hazardous, Time Sensitive, and Expired Chemicals

Hazardous substances (chemicals) are prone to be a physical hazard (flammables, explosives, oxidizers, etc.) and/or health hazard (allergens, carcinogens, irritants, etc.) and are under the Israeli Hazardous Substances Law (1993) regulations. Time Sensitive Chemicals are any chemical or chemical product that develops additional hazards upon prolonged storage. Therefore, safely handling, storing and disposing of hazardous chemicals procedures are critical. PI, Students and employees of the WIS institute are requested to follow the rules mentioned below in order to minimize safety risks to personnel and property:

- 1) It is **prohibited** to use a substance that is not included in the valid hazardous materials permit.
- 2) Hazardous substances should be purchase only from an authorized supplier by the WIS procurement department. Hazardous materials received from external sources should be approved by the WIS safety unit.
- 3) Exchange or transfer of hazardous substance/s between WIS's laboratories must be monitored by informing the safety unit and receiving a written permission.
- 4) Obtain and hold MSDS for any hazard material and review all safety measures needed for this compound especially for time sensitive chemical. Examples of these chemicals include peroxidizables (e.g. Diethyl ether), peroxides (e.g. Benzoyl peroxide), polynitrated aromatics (e.g. Picric acid), Chloroform.
- 5) Time-sensitive materials and gas cylinders should be monitored in the laboratory and properly disposed at regular intervals. If these materials are left in storage long enough, their management and disposal become increasingly hazardous and costly.
- 6) Never, under any circumstances, touch or attempt to open a container of peroxide-forming liquid if there are whitish crystals around the cap and/or in the bottle. The same for expired moisturized solid TSM's (e.g. Picric acid and Benzoyl peroxide), since the friction of unscrewing the cap could detonate the bottle. In both cases, secure the area with a warning note ('DON'T TOUCH, EXPLOSIVE') and notify immediately the safety unit (08-9343844) so that they manage the disposal.

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- 7) Purchase the smallest quantity that is practical for time-sensitive materials. Substitution with less hazardous materials or purchase them as dissolved in diluted solution is highly preferable (e.g. instead of as moisturized shock sensitive solids).
- 8) As a rule, disposal of any outdated and expired material in the laboratory is mandatory to prevent unnecessary accumulation of chemicals, additional physical/health hazards and even effects on your research results (due to some extent of degradation). Prominent examples are: acetylenic compounds, perchlorates, azides, organic acid halides and anhydrides, Sodium/Potassium metal, and thiols.
- 9) All hazardous chemicals must be stored in a safe manner according to the law and WIS's requirements. Chemical storage areas must be clearly labeled and marked, and all chemicals (and waste) must be segregated according to hazard classes.
- 10) Peroxidizables should be dated and disposed of within twelve months of opening or receipt.
- 11) Stabilized Chloroform should be disposed of after it has been open for longer than one year. If non-stabilized Chloroform is necessary for the work, it needs to be used up or disposed in a short period of time (3 months).
- 12) Purchase of Picric acid is allowed only as dissolved in diluted solution and not as moisturized solid. Purchase of moisturized Benzoyl peroxide (min 25% H₂O) requires a written permission from the safety unit.
- 13) Over time, the moisture that may slowly enter the cylinder, its effect on the exterior parts, and in case of a corrosive gas, initiate corrosion that may weaken the walls of the cylinder. Therefore, a laboratory or department will not keep in the laboratories/WIS a cylinder gas that the **hydrostatic test** validity is not valid.
In accordance with Israeli regulations, all compressed gas cylinders have to be hydrostatically tested every:
 - a) Inert gases, inflammable and flammable gases: 10 years
 - b) Toxic gases: 5 years
 - c) Corrosive gases: 3 years
- 14) All chemicals shall be listed on the lab's chemical inventory. Time sensitive chemicals shall also be dated on the inventory. The chemical inventory shall be reviewed annually.

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Appendix 2: (WIS's hazardous materials permit)

See attached file.