

Chemical waste disposal in the ESMP-Group

Everyone is responsible for dealing with chemical waste! At the end of this document a flow chart is provided, instructing how to deal with each type of waste. In order to use it properly, every person generating chemical waste in our laboratories must be able to determine whether their chemical waste is hazardous or not, and also to analyze which category of hazardous waste it may be. The following text explains how this analysis should be done.

**Do not store your chemical waste in the laboratories and hope it will disappear by itself.
Be active in avoiding, recycling or disposing hazardous waste!**

What qualifies as hazardous waste?

A hazardous waste is a chemical or chemical mixture to be disposed of that exhibits any corrosive, flammable, toxic, reactive and / or “persistent in the environment” properties. Additionally, all unknown substances (unlabeled bottle with chemicals) and all untested chemicals (e.g. self-synthesized new materials with unknown properties) have to be handles as hazardous.

Flammable / Ignitable

A waste chemical is flammable if it is one of the following

- A liquid having a flash point less than 60°C (e.g. ethanol, xylene, diethyl ether). The flash point is defined as the lowest temperature at which a chemical can form an ignitable mixture with air (by evaporating above an open beaker, for example). Use the Safety Data Sheets (SDSs) of your substances to get information about the respective flash points.
- A solid or gas capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and burns so vigorously and persistently that it creates a hazard.
- A solid, liquid or gas that releases oxygen at room temperature or under slight heating (e.g. peroxides, chlorates, perchlorates, nitrates and permanganates).

Corrosive

A waste chemical is corrosive if it has a pH of less than 2 or higher than 12.5. Note that any chemical has to be pH neutralized before being poured down the drain.

Reactive

A waste chemical is reactive if it is one of the following:

- Normally unstable compound that readily undergoes violent changes (e.g. acrylonitrile).
- When mixed with water, the chemical reacts violently, forms potentially explosive mixtures, or generates toxic gases in sufficient quantities to present a danger to human health (e.g. sodium metal).
- The compound contains cyanides or sulfides that when exposed to pH conditions between 2 and 12.5 could generate toxic gases in sufficient quantities to endanger human health (e.g. sodium sulfide, arsenic sulfide)

Toxic

Toxicity is based upon the LD₅₀. This information is listed on a chemicals SDS. Toxic and very toxic substances have to be clearly labeled with the respective pictograms. Very toxic substances have to be stored at a specially secured place and are to be disposed of separately.

Before working with chemicals listed as toxic or very toxic, ask for your supervisor's agreement and make sure that you learn the correct handling procedures. Do not hesitate to ask for advice!

Persistent

Persistent chemicals do not biodegrade quickly in the environment. There are two main categories of persistent chemical: halogenated organic compounds and polycyclic aromatic hydrocarbons.

i) Halogenated Organic Compounds

A halogenated organic compound (HOC) is a molecule that includes one or more atoms of fluorine, chlorine, bromine or iodine, for instance chloroform. When a waste mixture contains one or more halogenated organic compounds, the total halogenated organic compound concentration is determined by summing the concentration percentages of each halogenated organic compound. If a waste mixture contains more than 0.01 % HOC, the waste is persistent and therefore hazardous.

ii) Polycyclic Aromatic Hydrocarbons

Many polycyclic aromatic hydrocarbons (PAHs) form liquid crystalline phases or are used as dichroic dyes. Among others, the following PAHs are regulated: anthracene, perylene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene. When a waste contains one or more of these PAHs, determine the total concentration by summing the concentration percentage of each regulated PAH. If the waste contains more than 1% PAHs, the waste is persistent and therefore hazardous.

Mutagenic / Carcinogenic

Chemical waste known or suspected of affecting human DNA or causing cancer is hazardous waste, even if it is not toxic according to the definition above, which accounts for acute and immediate toxicity.

Unknown Chemicals

Any unknown or untested chemical compound is treated as if it fulfilled all the hazards described above. Unknown compounds are collected and disposed of separately. Be aware that disposing of unknown substances is very expensive, as the disposal company needs to perform an analysis of the potential hazard potential before it can dispose of the waste properly. The simplest way of avoiding unknown chemicals is to always properly label your vials, bottles, canisters etc.

General rules for dealing with hazardous trash

Waste must be under the control of the individual(s) generating the waste. The waste should be in a physically safe area (e.g. not on a windowsill). Waste chemicals may be stored with unused chemicals as long as the containers are properly labeled.

Do not accumulate large amounts of waste in the fume hood.

Do not store waste near or in sinks. If the waste is stored in an area that drains to a floor drain, the waste must be in a secondary containment.

Chemical waste must not be accumulated (i.e. stored) for more than one year!

Inherently Waste-like Chemicals

“Inherently waste-like chemicals” include expired chemicals, chemicals in deteriorating containers and chemicals that appear to be or are unusable. Do not keep chemicals past their expiration date, and conduct cleanouts when you do your chemical inventory update.

How to dispose hazardous waste in the ESMP group?

Hazardous waste is accumulated in our labs and regularly disposed of by the University. Make sure your chemical trash is not reactive, i.e. cannot easily undergo chemical reactions. Deactivate your chemicals if necessary before disposal. If you do not know how to do this, please ask a senior colleague.

There are canisters for liquid waste, closeable cans for solid trash and extra boxes for sharps and lab glass. If your waste does not meet the criteria for these canisters, please dispose of your waste separately in a suitable container and label it properly (see instructions below).

Liquid Waste

For the ESMP labs three canisters for liquid hazardous waste are available in the compartment below the hoods in Lab BS 2.13 (Chemistry lab).

Organic solvents (non-halogenated)



Examples are: Acetone, Ethanol, Toluene, THF etc.

Organic solvents (halogenated, persistent, and / or toxic)



Examples are: Dichloromethane, Chloroform, Methanol, Benzene, etc.

Water based waste (containing heavy metal ions)



Examples are: BaSO₄-solution, Fe₂O₃-solution etc.

Do not fill the containers completely. Each container must have at least 3-5 cm of headspace above the waste when it is collected. Replace containers ahead of time to avoid overfilling your containers. Contact Zory or Olga who will bring the filled canisters to the bunker and provide empty canisters. Always make sure to label new canisters clearly and with permanent labels.

Solid Waste

General Trash: Used gloves and other commonly used items (besides empty containers) can be placed in the general trash if they are not contaminated with hazardous chemicals.

Hazardous Waste: If you have an item that is contaminated by hazardous chemicals, dispose of it in the closable can for hazardous chemical residues, either in Lab BS 1.10b (Electrospinning Lab) or in Lab BS 2.13 (Chemistry Lab).

Hazardous Chemical residues



Examples of hazardous chemical residues are used spill clean-up materials, gloves and equipment contaminated from a spill or used equipment that contains residues of hazardous chemicals.

Sharps: Sharps are collected in a closed plastic container in Lab BS 1.10b (Electrospinning lab) and Lab BS 2.12 (Microscopy).

The sharps definition includes:

- Cannulas
- Syringes with attached needles
- Lancets
- Scalpel blades

“Sharps” also includes the following if contaminated with a hazardous material

- Broken glass
- Pasteur pipettes
- Glass tubes
- Glass slides and cover slips
- Other, similar items

Lab Glass: Lab glass waste comprises items that could puncture regular waste bags and endanger waste handlers, and is not contaminated with hazardous chemicals. Lab glass is collected in sturdy plastic buckets located in Lab BS 1.10b (Electrospinning lab) and Lab BS 2.12 (Microscopy).

Examples of “lab glass” include:

- Broken glassware
- Empty chemical containers (test tubes, pipettes, etc.)
- Fragile glass items such as glass Pasteur pipettes, glass slides and cover slips, provided that they are not contaminated with hazardous materials.

Other waste

Containers: Accumulate waste in an appropriate container compatible with the waste. You may reuse containers, even containers that were used for other chemicals, if they have been rinsed and the original labels have been removed (note that the rinseate may be hazardous waste). Containers that were designed for solid chemicals should not be used for liquids. Use only containers that show no sign of damage or deterioration. For hazardous waste, you must use containers with screw top closures. Waste containers must remain closed except when you are adding waste.

Hazardous Waste Labels: Label the container permanently and add the respective pictograms for hazardous substances.

Chemical waste disposal – Flow chart

