

Hazardous Material Recycling and Disposal Information and Guidelines

Forward

The generation of unwanted hazardous materials and waste products is an inevitable consequence of chemistry research and shop activities. Strict labeling, segregation and packaging requirements must be followed to ensure that unwanted hazardous materials are handled safely and recycled or disposed of in an environmentally sound manner. The following guidelines have been prepared to assist researchers and college staff in meeting their hazardous material recycling and disposal responsibilities.

Drain Disposal Guidelines

The disposal of chemicals into any sewer system is controlled by Federal, State, and local laws and regulations. As written, these laws prohibit any drain disposal of *hazardous wastes* and severely limit the allowable wastewater concentration of a number of specific substances. The range of substances that can be considered to be hazardous waste is enormous. Indeed, almost any chemical substance is unacceptable for drain disposal if it is disposed of in large quantities or in high concentrations.

Federal and California hazardous waste laws do permit laboratories to drain dispose of small amounts of some chemicals in quantities that do not pose a hazard to human health or the environment. In order to help researchers determine which chemicals and quantities are acceptable for drain disposal, UC Berkeley has developed guidelines that apply to drain disposal of chemicals from laboratory sinks on campus. In general, laboratory sink disposal of chemicals is limited to the occasional disposal of small amounts of chemicals of high water solubility. All researchers should review the attached "Interim Guidelines for Drain Disposal of Chemicals" (see Appendix 6a) very carefully prior to discharging any chemical in laboratory sinks.

Redistribution of Commercial Chemicals

The Chemical Reuse Facility

To donate commercial chemicals that are both in good condition and in their original containers with intact labeling, contact the Facility's specialist at 2-2630. Under-stocked chemicals for which there is suspected demand will be accepted. Jug solvents, mineral acids, explosives, gases and chemicals in pressure-containers will not be accepted.

Solvents, Gases and Mineral Acids

Contact the College EHS&S team at 2-2630 to help you recycle or dispose of these materials.

Disposal of Routinely Generated Hazardous Materials

Chemically Contaminated Laboratory Debris

Laboratory debris such as used paper towels, pipettes, gloves, glassware, and open containers that are contaminated with trace amounts of chemical residue, cannot be disposed of in the municipal trash and must be disposed of in the white or green 5-gallon buckets labeled “Chemically Contaminated Material Only.” These buckets are picked up, emptied and returned to each laboratory by College EHS&S team. Call 3-0526 to schedule a pick up.

Solvents, vials or containers of liquids, sharps or bulk quantities of chemicals are **NOT** to be placed in these pails. Small EMPTY vials or containers can be placed in the white buckets if there are only trace amounts of chemical residue. Notify the EHS&S program at 2-2630 to arrange for a chemical lab pack of your unwanted bulk chemicals. Your research director will be billed by the pound for Contaminated Laboratory Debris, so do not put uncontaminated material in these special buckets.

Corrosive Acids, Bases, Strong Oxidizers

These spent liquids should be collected in the same type of container they were delivered in, i.e. glass in most cases. Keep mineral acids segregated from organic acids and keep strong acids segregated from dilute solutions. Keep caustics/bases segregated from acids and other oxidizers. College supplied containment trays are available to assist you with segregation and separation. Call 3-0526 for trays.

Cyanide containing spent liquids should only be collected in 1 liter volumes due to the unique disposal requirements stipulated in the U.C. system wide hazardous waste contract. If the Campus Hazardous Material Facility receives cyanide-containing liquids in excess of 1 liter, they will have to split the item down to 1 liter containers and charge the group accordingly.

Spent Liquids; Solvents (pure or containing trace organics), Aqueous Containing, & Oils.

The College of Chemistry follows the Campus model for spent bulk liquid disposal. Campus EH&S service can be reached at 642-3073. There is online training available that guides you through the disposal process. The title of the online course is “EH&S Liquid Waste Training (College of Chemistry)” It is located on the “etrain.berkeley.edu” server and soon on the U.C. systemwide Learning Management System (LMS).

All spent liquids in this category should be containerized and segregated according to Table 1 [Bulk Solvent Profile](#) in order to minimize the disposal cost to the group. The table is written in the context of what you can put into a solvent waste jug and maintain the minimum fee for disposal.

A brief summary of the table is as follows: (an expanded explanation is listed below Table 2)

Tier 1 is the bulk solvent profile, which is the least expensive pathway.

Tier 2 lists reactive waste constituents and is defined as Lab Pack Reactive. This means you should collect these chemicals separately from bulk solvents, as these are charged at much higher disposal rates.

Tier 3 lists conditions that the waste needs to meet in order to stay at the least expensive rate. If one of these conditions is violated, then the waste gets defined as “Lab Pack non-reactive. See Table 2 for price estimates.

The container label should be completely filled out to identify all chemical constituents using CAS-identifiable chemical names. Abbreviations, chemical structures or nomenclature is not acceptable. The College of Chemistry EHS&S program furnishes free 1 gal poly bottles that are compatible for most solvents and oils.

Table 1 is to be used as a guide for the collection and segregation of spent liquids.

	BtuH	BtuL	BSI
Tier 1	Water <=20% Halogen <=5% Water + Halogen <=20%	Water <=20% Halogen <=20% Water + Halogen <=20%	Water <=60% Halogen <=80% Water + Halogen <=80%
Tier 2	No RCRA Metals No elemental Bromine (or) Bromine Solutions No Cyanides or Sulfides No Mercaptans or Thiols No Dioxins or Pesticides	No RCRA Metals No elemental Bromine (or) Bromine Solutions No Cyanides or Sulfides No Mercaptans or Thiols No Dioxins or Pesticides	No RCRA Metals No elemental Bromine (or) Bromine Solutions No Cyanides or Sulfides No Mercaptans or Thiols No Dioxins or Pesticides
Tier 3	No sludge >1/2” No dark and opaque bottles pH = 4 to 10	No sludge >1/2” No dark and opaque bottles pH = 4 to 10	No sludge >1/2” No dark and opaque bottles pH = 4 to 10
Table 1: Bulk Solvent Profile			

Tier 1 describes the allowable aqueous/solvent percentages for that particular waste stream. Any of the three categories, BtUH, BtUL, or BSI is acceptable. Remember, all constituents must be listed by percentages and must add up to 100%. The cost difference between the 3 is very small and is listed in Table 2.

Tier 2 constituents are listed next in the line. If any of the listed constituents are in the waste mixture above trace amounts, it will not meet the bulk rate profile specifications; Therefore, these constituents should not be combined with Tier 1 materials whenever possible. Care should be taken to keep the volume of Tier 2 materials to a minimum in your waste streams. These are referred to as Lab pack items. There are two categories: Lab-pack Non-reactive, and Lab-pack Reactive. The reactive constituents in Tier 2 are: cyanides, sulfides, mercaptans, thiols, dioxins, pesticides. Elemental bromine and its solutions are charged at a higher rate than reactives.

Tier 3 conditions must be met in order to qualify for the cheapest disposal rate. Any dark or opaque bottles must have listed constituents that would reasonably give rise to the dark or opaque quality. Depending on the darkness and/or opacity the waste may be bulked or designated as a Lab Pack. It is the final decision of the Hazardous Materials Facility staff as to whether the specific darkness or opaqueness moves the container out of the bulk rate and into the lab-pack rate. Sludge of greater than ½ inch of would eliminate the container from the bulk rate, as well as pH's listed outside the range. Proper pH testing is imperative, whereas, solvents and phased spent liquids must be sampled appropriately in order to reach a valid pH level. Call the EHS&S program if you are getting waste rejected for pH problems at 2-2630.

HazCat refers to liquids that have no definitive labeling and must be sampled for characterization. The HazCat charge is in addition to the per pound fee once it is identified. All current prices are reflected in Table 2.

BtuH	\$0.72/lb
BtuL	\$0.72/lb
BSI	\$0.96/lb
Lab Pack Non-Reactive	\$4.20/lb
Lab Pack Reactive	\$20.70/lb
Elemental Bromine and Solutions	\$21.74/lb
HAZCAT Charge	\$34.12
Table 2: Waste Chemical Costs	

Disclaimer: Prices subject to change at any time. Use for comparative purposes only.

Empty Glass and Metal Chemical Containers

Empty 4-liter glass bottles and steel or aluminum ether cans can be disposed of by placing them in the specially labeled bins located in corridors throughout the College. Note that only completely empty containers that are totally free of chemical residue can be disposed of in this manner. The legal criteria for what constitutes an “empty” container are very strict and are defined in the attached Glass Solvent Bottle Disposal Guidelines (see Appendix 6b). All generators of disposable glass solvent bottles should review these guidelines to insure that

empty containers are managed properly. Glass that is determined to be not legally empty must be disposed of as Contaminated Laboratory Debris as described above.

Used Laser Dye

Used methanol laser dye is also collected from the labs in gallon jugs and can usually meet the bulk solvent profile if it contains a low percentage of DMSO. (Unfortunately, DMSO-based laser dyes must be handled as a Lab Pack item rather than the bulk solvent profile.) Collect DMSO dyes in properly labeled gallon jugs and dispose through the Campus bulk spent liquids program.

Excess Commercial Chemicals (liquid and solid)

Commercial chemicals that the Reuse Facility is unable to accommodate will be submitted for disposal. Call the College EHS&S program at 2-2630 to receive materials and instructions for proper packing of your bottles, or to arrange for our staff to do it for you.

Products of Experiments

Liquid and solid products generated from experiments that do not fit the above criteria still must be containerized, labeled and handled by the EHS&S program.

Disposal of Special Hazardous Materials

Full Height Gas Cylinders

Full height gas cylinders, whether empty or partially full, should be taken to the College Receiving Dock (B84 Hildebrand) and checked into the cylinder cage for return to the vendor. Helium tanks are the exception. These should be returned to the College's Liquid Air Plant in Giaque Hall.

Small Gas Cylinders

It is very costly to send small gas cylinders (less than 8" in diameter and 24" in height), lecture bottles and other assorted pressure containers to a disposal vendor. Available alternatives include fully-utilizing a cylinder's contents within your lab or passing the partially full cylinder to another researcher who will. Once a cylinder is empty simply remove the valve with a wrench, preferably within a hood. Place the cylinder body upright in the hood to air out and once all odor has dissipated call the EHS&S program at 3-0526 to arrange for pick up. If a cylinder contains a reactive gas or liquid, it can be quenched and purged before the valve is removed. Call the tech support number of the original seller (Aldrich, Matheson, etc.) and ask that quenching/purging instructions be sent to you by fax.

If a gas cylinder must be sent for disposal, notify the College EHS&S program at 3-0526.

Lecture bottle size cylinders will be gathered and submitted to the campus's contracted disposal company once or twice per year, at a charge of \$200-\$800 per cylinder, depending on the type of gas. A cylinder containing an UNKNOWN gas will cost \$1500-\$5000 and the procedure may take as long as a year. If the cylinder is inoperable or the valve is damaged the costs can exceed \$20,000. Be sure to evaluate your unwanted cylinders carefully! Problem cylinders need to be brought to immediate attention of the P.I. and EHS&S.

AT LEAST TWICE PER YEAR, CHECK TO SEE THAT YOUR GROUP'S STORED GASES HAVE SECURE, MULTIPLE LABELS. Also make sure that all gas cylinders are entered into your 4D chemical inventory.

Batteries

Alkaline, zinc-carbon dry cell, sealed small lead acid batteries and lithium batteries are considered Universal Wastes and must be disposed of accordingly. There are two areas where universal waste batteries are collected: 791 Tan Hall (chem stores) and 317 Lewis Hall. Wet-cell batteries are disposed of similarly to Lab-Packed chemicals. Contact 2-2630 to arrange for pick up of wet-cell batteries. Contact the College EHS&S program if you have batteries that don't meet the above descriptions. At no time should ANY battery be thrown into the common trash.

Controlled substances

Detailed instruction on managing and disposing of controlled substances is provided in a Campus EH&S Help Sheet and can be found on their website or see Appendix 6e in this section of the College of Chemistry Health and Safety Manual.

Potential explosives

Contact the College EHS&S program at 3-0648 for guidance.

Medical waste/Bio-hazardous waste

Detailed instruction on managing and disposing of medical waste is provided in a Campus EH&S Help Sheet (see Appendix 6c in this section of the College of Chemistry Health and Safety Manual).

Mercury

Mercury containing thermometers and other analytical devices need to be disposed of through the College EHS&S program. If you have a very small mercury spill you can clean it up yourself. Contact the College Health and Safety team at 3-0526 or 3-0648 for assistance in disposing of spilled mercury and contaminated debris. Any other mercury spill should be cleaned up by trained, qualified personnel. If a spill occurs, evacuate the room, control access and call 2-9090 for help.

Radioactive Waste

Radioactive waste must be handled and disposed of in strict compliance with the UC Berkeley Radiation Safety Manual. All radioactive waste (radwaste) must be kept bagged in properly marked and shielded waste containers. Solid wastes cannot contain any freestanding liquid. Liquid radwaste must be kept in double containment. Radwaste must be kept segregated by isotope. Do not intentionally mix chemical wastes and radwaste. Mixed wastes should be avoided whenever possible.

Radwaste pick-up and disposal is managed by the UC Berkeley Office of Environment, Health and Safety (contact Pat Goff at 2-1925 for more information).

Sharps – Chemically Contaminated Sharps

All chemically contaminated needles and razor blades need to be disposed of in the red sharps containers (available from the storeroom). Make sure to write the words “Chemically Contaminated Sharps” on the outside of the container in black ink. Deface the bio-hazard/etiological agent symbol. Unused sharps should also be placed in these containers for disposal. Contact the College EHS&S program (3-0526) for pickup and disposal.

Sharps – Medical Waste, Bio-hazardous

Sharps that are contaminated with bio-hazardous materials must be handled according to the medical waste disposal guidelines (see Appendices 6c and 6d in this section of the College of Chemistry Health and Safety Manual). Red containers with appropriate labeling are available through chemstores.

Silica Gel

Used silica gel and other chromatographic supports should be deposited into the appropriately labeled blue 5-gallon pails within the plastic liner that is provided with each blue pail. Contact the College EHS&S team at (3-0526) for disposal.

Unknown liquid or solid chemicals

Contact the College EHS&S team at 3-0648. Unknown materials cannot be sent for disposal until they are characterized. Identification of unknown material hazards is costly, so make a strict habit of keeping ALL chemical containers properly labeled. Refer to Table 2 for HAZCAT testing fee charges. These charges are per item.