City University of New York HPLC Safety & Environmental Guidelines

Objective: The proper management of waste that is generated through HPLC (High Pressure Liquid Chromatography) processes.

Overview: Safety concerns during HPLC processing typically surround the use of high electrical voltages in close proximity to flammable and/or combustible liquids. Therefore the installation and operation of HPLC modules must be in compliance with applicable National Electric Codes (i.e., NFPA 30, NFPA 45, and/or NFPA 70). In terms of chemical safety, the Material Safety Data Sheet (MSDS) of each solvent used during the mobile phase should be consulted before use; hazards such as the toxicity and flammability of organic solvents must be reviewed and integrated into standard laboratory procedures. Common solvents used for HPLC processing such as acetonitrile, methanol, acetone, and hexane can be used safely in the lab as long as proper personal protective equipment (PPE) is used and appropriate engineering controls are in place. Since such solvents are classified as ignitable (depending on concentration), they must be managed as EPA hazardous waste unless being re-used- even while the effluent container is still attached to the HPLC unit. In addition to EPA regulations, the Resource Conservation and Recovery Act (RCRA) governs the storage and disposal of chemicals and solvent wastes.

Procedures:

Proper Storage of HPLC waste

The waste container shall comply with all Satellite Accumulation Area (SAA) requirements:

- Waste solvents should be stored in a rated flammable liquid container while being filled during HPLC operation
- Container must be kept closed during storage
- A hazardous waste label must be fixed to the container with all chemical constituents listed (no formulas/ abbreviations)
  - Hazardous characteristics should be clearly indicated on the label
- An appropriate secondary containment tray must enclose the waste bottle

Proper Collection of HPLC waste

- A waste bottle should be attached to the outlet piping of the HPLC machine to collect waste chemicals
- The interface of collection piping and collection container must be maintained with a tight seal, such that evaporation of waste is avoided*
- Lab personnel should monitor the collection of this waste and take action to notify the EHS office when the container is about 80% full
- EHS personnel should be responsible for dating the full container and removing it from the laboratory to a designated hazardous waste storage or Main Accumulation Area (MAA), if applicable
- Lab personnel should be responsible for replacing the collection bottle for HPLC waste:
  - A hazardous waste label or tag should be fixed to the new collection bottle and filled in appropriately as soon as waste is generated

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Proper Transport of HPLC Waste

- Most HPLC-grade solvents are available in 1-gallon containers and should be transported in an appropriate secondary container such as rubberized carrier
- If using stainless steel "kegs" or clycletainers for dispensing HPLC liquids, they must be transported in an approved chemical safety cart

Proper Disposal of HPLC Waste

- If SAA contains more than 55 gallons of hazardous waste or greater than 1 gallon of acutely hazardous waste, the HPLC waste container must be dated and removed to the MAA within 3 days
- Disposal of waste must be in accordance with RCRA standards for hazardous waste (ignitable/ toxic)
- Solvent disposal safety cans can be purchased with built-in evaporative control and bottom tray for secondary containment

Standard Operating Procedures:

The following practices should be integrated when operating HPLC units

- Any operator must be appropriately trained and initially supervised by an experienced operator
- Prime all pumps and tubing with solutions to ensure no air bubbles in the system
- Prime pumps, column and system with the mobile phase, ensuring no leaks in the system and that waste is collected in appropriate container
- When finished, flush column with storage solution; flush pumps well with distilled water followed by appropriate disinfectant to prevent microbial growth
- After turning off the system power supply, check for and clean any leaks or residual buffer solution

The following practices should be integrated when handling mobile phase solvents

- Select personal protective equipment that is compatible with the solvents being used
- Prepare, filter, and degas all solutions in a laboratory fume hood
- Ensure all solution containers have caps or covers to prevent fumes escaping and dust entering solutions
- Ensure all solutions are labeled with appropriate chemical name and warnings, if applicable

Other Considerations:

- *Due to the set-up of standard HPLC apparatuses, options for achieving a tight seal on the waste container are often limited. Three methods to consider include:
  - Purchase a waste disposal container specifically designed for this purpose; tubing ports can be built into the container cap to ensure a tight connection (i.e., Justrite Quick Disconnect HPLC Safety Disposal Can)
  - Rubber stoppers may be purchased from most laboratory supply companies and fitted to the unit
  - Drill a hole into the cap of the waste container and seal with silicone after tubing has been inserted to avoid air/ liquid penetration
- Under no circumstances should tubing ever be draped into an open flask due to the potential for evaporation and spills
- The potential danger for flask implosion during vacuum filtration and degassing should be addressed; coated glass equipment and safety shielding may be considered
- The use of smaller HPLC columns should be encouraged to conserve solvent usage and minimize hazardous waste generation

References:

Columbia University. *Hazardous Waste Management Overview- Morningside*. 2008 Columbia University.

Modern HPLC for Practicing Scientists, by Michael W. Dong. Copyright 2006 John Wiley & Sons, Inc.

Reinboth, Betty. Safe *Operating Procedure (High Pressure Liquid Chromatography HPLC)*. University of Adelaide, Australia. May 6th, 2008.