

Alternatives to Traditional Thermal Distillation

By Dionna Thomas

Distillation of organic solvents is a necessary part of academic research. Typically, researchers use the distillation process to remove water, oxygen, and other contaminants from organic solvents. This process can be hazardous for several reasons:

- Reactive metals are used as drying agents
- Many organic solvents are flammable, and the heat required in the distillation process can present a fire hazard
- Flasks have to be cleaned at regular intervals
- The distillation process takes place over several hours. So, at times, the distillation unit is left unattended
- The remaining drying agent may need to be neutralized and disposed of as hazardous waste

In 2003, the American Chemical Society (ACS) published a journal article on alternatives to solvent purification. The ACS suggested solvent purification processing systems as cost-effective alternatives to the traditional thermal still.

The solvent purification systems use stainless steel columns to retain the solvent. Dry argon gas is used to force the solvent over columns that contain activated alumina and copper catalyst. The alumina removes the water and the copper catalyst removes the oxygen.

Initially, the commercial purification column has a higher cost, but the article suggests that the annual operating costs are lower because larger volumes of solvent can be purified by one column. Additionally, the authors suggest that the solvent purification system is more effective than the traditional thermal still for other reasons:

- 1. The quality of the solvent purification system meets the tests for removing water, oxygen, and peroxide contaminants.
- 2. Solvent purification systems have automatic controls that shut down the system if overheating occurs.
- 3. More than one column can be purchased to allow purification of more than one solvent at a time.
- 4. The purification system operates at room temperature. Heat is not required to purify the solvent.

The following table includes data from the article that compares the set up costs, operational costs, and solvent purity for the solvent still and purification column.





Environmental Health and Safety Office Research Administration

Training

Most of EHSO's Trainings are available online. <u>www.ehso.emory.edu</u> for registration information. <u>Radiation Safety Training</u> 2nd Tuesdays at 9:00 am Laboratory Safety Train-

ing 3rd Thursdays at 10:00 am

Chemical/Radioactive Waste Pick-up Schedule

Full Schedule here...

All **chemical** waste pick up should be requested by emailing

chemwaste@emory.edu

All **radioactive** waste pick up should be requested via EHS Assist pick-up.

Chemical waste disposal inventory form and/or radioactive waste inventory form should accompany all waste containers at the time of pickup.

PPE

Choice to be based on potential exposures involved:

Eye: Glasses, goggles & face shields

Gloves: Appropriate for the type of procedure Clothing: Gowns, lab coats, aprons, coveralls **Respirators**: Appropriate for the type of procedure



Cost Comparison	Solvent Still	Commercial Purification Column
Cost (Set Up)	\$4800	\$6300
Cost (Annual Operating)	\$4000	\$100
Purification Test	Solvent Still	Commercial Purification Column
Water Content (ppm)	10 ppm	<1 ppm
Oxygen Content (ppm)	100 ppb	10000 ppb
Peroxides (ppm)	<1 ppm	<2ppm

The distillation process will continue to be an important aspect of research. Since the process may require the use of reactive metals and heat, less hazardous alternatives should be considered. The column purification system could be a reasonable, cost-effective alternative to this necessary process.

References:

Cournoyer, Michael E. and Dare, Jeffrey H., "The Use of Alternative Solvent Purification Techniques," *Journal of Chemical Health and Safety* [online] **2003**, *July/August*, 15-18.

Grubbs, Robert H., et. al, "Safe and Convenient Procedure for Solvent Purification," *Organometallics* **1996**, *15*, 1518-1520.

NEW

EHSO has published three new Biological Agent Reference Sheets (BARS) to the EHSO website. The BARS are in regards to the following agents: Mouse and Rat Cytomegalovirus, Staphylococcus aureus and Streptococcus pneumoniae.

Notice

Signature indicates: I have read and I understand the information in this issue of Lab Rat Newsletter. Use an additional sheet of paper for more signatures, if needed and attach to this document.

• This newsletter is a tool to help fulfill a legal requirement for ongoing safety training.

• Supervisors are responsible for ensuring that individuals in their area have read and understood the information that applies to their area.

• The signed newsletter should be placed into the PIs EHSO Lab Safety Binder.

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Eye Wash Testing

Lab Personnel should test the eyewash station once a month.

Certifications

Bio-safety Cabinets/ Chemical Fume Hoods Certification<u>required</u> annually.

Fire Extinguishers

Visual fire extinguishers inspections conducted monthly: A. Is it present and mounted in its proper location? B. Is it readily accessible? C. Initial and date attached tag. If it appears to need servicing contact the Maintenance HELP line at 7-7463

Tell us how we are doing!

The newsletter has a new home. Every individual article is now hosted online at blogs.emory.edu/ labratnews/ Got something to share? Tell us! Post comments, related articles/links, and safety concerns. Feel free to also send your comments to biosafe@emorv.edu. We look forward to reading your ideas and comments!

Building Liaisons

<u>Click here</u> to find your building's Radiation and Research liaisons.