

## Chemical Hygiene Plan

The Iowa State University Laboratory Safety Manual serves as the campus-wide Chemical Hygiene Plan. Research activities at Iowa State University laboratories must adhere to the safety requirements defined in this document.

## Readiness Review

In addition, all Ames Laboratory activities must be previously approved by the Safety Review Committee via the Readiness Review process. Ask your supervisor if you have any questions, and make sure you are authorized to proceed before beginning work.

## Hazards of Potentially Explosive Chemicals (PECs)

Chemicals such as ethyl and isopropyl ether, tetrahydrofuran (THF), and 1,4-dioxane can form peroxides (PECs) during use or in storage. Other chemicals such as picric acid and other di- and tri-nitro compounds are also PECs. The Safety Data Sheet provided by the manufacturer will disclose if a particular chemical is or is likely to become a PEC.

- Some chemicals are unstable in storage. They react with the oxygen in air to form hazardous compounds, called peroxides.
- Certain peroxides may explode with exposure to shock, heat, or sparks. They may also react violently with other chemicals.
- Once peroxides have formed, the container can explode when moved or opened, causing death or serious injury.

- Discoloration, layering, and formation of crystals in stored liquids are all indications that a serious hazard may exist. Do not disturb containers of PECs that exhibit these characteristics.

Photo 1.  
Discoloration &  
Layering



## Proper Storage

- Purchase only the amount you expect to use within a six-month period or less.
- Apply yellow PEC warning label upon receipt, and record the date on it.
- Avoid exposure to light, air, and heat. Follow label directions for storage conditions. Consider inert gas blanket.

## Personal Protection Equipment

- Eye Protection: Safety glasses with side shields (minimum); Chemical Goggles.
- Gloves: Nitrile, latex, neoprene laminate, or as recommended by the manufacturer.
- Clothing: Lab coat. Consider using fire resistant clothing.

## Handling Precautions

- Conduct all work in a lab hood. Use blast shields where appropriate.
- A nearly-empty bottle is more likely to be hazardous than a full one.
- If evaporation, extraction, or distillation procedures are required, test first and monitor process carefully. **NEVER DISTILL TO DRYNESS!**

## Spill Management

Personal protective equipment (PPE) requirements for spill response may be greater than those for routine handling. Evacuate to a safe location and call for help if adequate PPE is not available.

- Get assistance with large spills by calling 911, ISU EH&S (4- 5359), or the Ames Lab ESH&A office at 4-2153.
- Notify your supervisor of any spill that has occurred.
- Contact appropriate office for disposal of spill products.

## Testing for Peroxides

**Please note:** It is ultimately the user's responsibility to ensure his or her safety by assessing each bottle before use.

Ames Laboratory Environmental Safety, Health & Assurance (ESH&A) tests PECs in Ames Laboratory spaces twice a year.

**IMPORTANT!** Never test containers of unknown age or origin. Undated bottles may contain concentrated peroxides, or peroxides may have

crystallized in the cap threads, which may explode when opening the bottle for testing.

- Dip strips are the preferred test method for volatile solvents.
- Purchase dip strips from ISU Chemistry Stores. Follow the instructions.
- Test unopened containers on or before their expiration date, or within one year of receipt.
- Test opened containers every six months.
- Always record your results on the PEC warning label.
- Test or re-test any PEC which will be used in a distillation or extraction, regardless of age. Do not concentrate if **any** level of peroxide is found.
- Dispose of reagent or treat peroxides before level exceeds 100 ppm.



Photo 2. Quantofix™- Peroxide test strips

## Disposal

- Contact the appropriate office for disposal of unwanted hazardous materials.

## Labeling

WARNING! MAY FORM EXPLOSIVE PEROXIDES  
THIS CHEMICAL HAS A LIMITED SHELF LIFE

Store in tightly closed original container. Avoid exposure to light, air and heat.  
If any crystals, discoloration, or layering are visible, do not open.  
Contact ISU EH&S (294-5359) or AL ESH&A (294-2153) for assistance.

Date received \_\_\_\_\_ Date opened \_\_\_\_\_

**PEROXIDE TEST RESULTS**  
(If peroxides are present **DO NOT DISTILL** before treating)

Mandatory Testing Interval - 6 months

Date \_\_\_\_\_ Result \_\_\_\_\_ Initials \_\_\_\_\_

Date \_\_\_\_\_ Result \_\_\_\_\_ Initials \_\_\_\_\_

Do not use chemical if greater than 100 ppm of peroxide are detected.

Photo 3. PEC Warning Label. Labels are available at Chem Stores or calling 515-294-5359 or 294-2153.

## References

**Laboratory Safety Manual**, Environmental Health and Safety, Iowa State University  
<http://www.ehs.iastate.edu/publications/manuals/absm.pdf>

**Potentially Explosive Chemicals (PECs), Guidelines for Safe Storage and Handling**, Environmental Health and Safety, Iowa State University  
[www.ehs.ISU.PEC.Guidelines.edu/publications/factsheets/pec.pdf](http://www.ehs.ISU.PEC.Guidelines.edu/publications/factsheets/pec.pdf)

**NOTE:** This information is not intended to replace the Safety Data Sheet (SDS). Always read the SDS and be aware of the hazards.

Handout 10200.030 Revision 6.0  
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## Contact Information

Iowa State University  
Environmental Health and Safety  
2809 Daley Drive – (515)294-5359

Ames Laboratory  
Environment, Safety, Health & Assurance  
G40 TASF – (515)294-2153

# Peroxide-Forming Chemicals

## Safe Handling Precautions

Ames Laboratory users of PECs must complete Hazard Communication Training (AL-137) and activity-specific training prior to work.

Iowa State University users of PECs must complete Lab Safety – Core Concepts and activity-specific training prior to work.

