



Consider this picture from a laboratory refrigerator explosion in 1982. Many small tubes of petroleum ether were stored in an ordinary domestic freezer. Petroleum ether, a very flammable liquid, has a flash point as low as -56°F , and is classified as a Class 1A flammable with an NFPA 704 fire hazard rating of 4.

Apparently the tubes were not sealed well, and over time, the petroleum ether evaporated in sufficient quantity that the concentration exceeded the low explosive limit, about 1.0%. A spark from an internal component (e.g., thermostat, light switch) caused the vapor of the liquid to detonate.

There were no personal injuries in this case, as the explosion took place at night. However, along with the freezer, one liquid scintillation was destroyed, and another was seriously damaged. The result was \$11,000 in damage to the room and \$25,000 damage to equipment. Today, this would amount to more than \$250,000.

Preventing Explosions

To prevent refrigerator and freezer explosions, lab supervisors must vigorously enforce the following:

- All materials with a flashpoint below

100°F may only be stored in a UL approved flammable materials storage refrigerator or freezer. These units do not have any internal ignition sources.

- All ordinary domestic refrigerators and freezers should be labeled with the phrase “No materials with a flashpoint below 100°F may be stored in this refrigerator/freezer” or “Not for flammable storage.”

Getting Assistance

For additional information about selecting appropriate refrigerators and freezers, storing flammable chemicals and chemical compounds with low flash points, or proper labeling for laboratory refrigerators and freezers, contact EH&S.



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Laboratory REFRIGERATORS and FREEZERS



Selection, Care, and Use

Refrigerator and Freezer Hazards

The potential hazards posed by laboratory refrigerators and freezers involve vapors from the contents, the possible presence of incompatible chemicals, and spillage.

Loss of electrical power can produce extremely hazardous situations. Flammable or toxic vapors may be released from refrigerators and freezers as chemicals warm up and/or certain reactive materials may decompose energetically upon warming.

Laboratory Refrigerator/Freezer Design

Only refrigerators and freezers designed for laboratory use should be utilized for the storage of chemicals. These refrigerators have been constructed with special design factors, such as heavy-duty cords and corrosion-resistant interiors to help reduce the risk of fire and explosion.

Only chemicals should be stored in chemical storage refrigerators; lab refrigerators should not be used for food storage or preparation.

Refrigerator/Freezer Labeling

Refrigerators and freezers should

be labeled clearly for their intended purpose (e.g., "No Food or Drink to be Stored in this Refrigerator", "Refrigerator For Food Only", "NO FOOD - CHEMICAL STORAGE ONLY", "Not For Flammable Storage", etc.).



Flammable Liquid Storage

Standard refrigerators have electrical fans and motors that make them potential ignition sources for flammable vapors. Therefore, flammable chemicals or chemical mixtures that must be kept below room temperature must be stored in refrigerators or freezers specifically designed by the manufacturer to be explosion proof.

Flammable liquid-approved refrigerators are designed with spark-producing parts on the outside to avoid accidental ignition. If refrigeration is needed inside a flammable-storage room, you should use an explosion-proof refrigerator.



All other refrigerators or freezers not specifically designed to be explosion proof should be labeled with a prominent warning sign indicating that they are unsuitable for the storage of flammable substances.

Electric heaters used

to defrost the freezing coils can also spark. To ensure its effective functioning, a freezer should be defrosted manually when ice builds up.

Frost-free refrigerators should also be avoided since many of them have a drain tube or hole that carries water, and possibly any spilled materials, to an area near the compressor, which may present a spark hazard.

Refrigerator/Freezer Contents

All materials in refrigerators or freezers should be labeled with the contents, owner, date of acquisition or preparation, and nature of any potential hazard.

All containers should be sealed, preferably with a cap, and placed in secondary containers or catch pans. Since refrigerators are often used for storage of large quantities of small vials and test tubes, a reference to a list outside of the refrigerator could be used. Labels and ink used to identify materials in the refrigerators should be water-resistant.



Refrigerator/Freezer Explosions

Flammable liquids must only be stored in refrigerators which have no internal ignition sources.