Fact Sheet

Refrigerators & Freezers in the Laboratory

Hazards

Improperly storing hazardous materials in a refrigerator can cause explosions, fires, and poisonings.

Cooling elements, internal lights, defrost switches, and timers inside refrigerators are often capable of producing enough of a spark to ignite flammable vapors. Sparks generated by the electrical equipment inside a refrigerator have been known to set off explosions that have destroyed refrigerators and harmed people and parts of the lab around it.

Common Types of Refrigerators

If your lab uses flammables, consider purchasing ONLY flammable-safe refrigerators, even if you don't plan to use them all for flammables. This will prevent materials from ever being stored in an unsafe refrigerator.

	Flammables?	Features	Description
Standard/ Domestic	**Do not store inside**	Often has lights will turn on inside when door is opened, auto defrost, $	Has internal components capable of producing a spark that could ignite flammable vapors
Modified Domestic	Yes	Only possible on older models with manual defrost. No lights, $	Relocating internal ignition sources in a domestic fridge for flammables voids your warranty.
Flammable Safe	Yes, preferred	Self-closing doors, magnetic door gaskets, special liner materials $$	Intrinsically safe interior isolates internal ignition sources e.g. thermostat, motors, switches, lights
Explosion–Proof	Yes, not necessary	Both internal and external ignitions sources are protected $$$$	flammable environments should not occur in a university setting

Signage

All the refrigerators in your lab must be signed appropriately for what is allowed to be stored in them.

- Specify either "FLAMMABLE SAFE" or "Do NOT store Flammables"
- Specify either "Lab use only. NO Food or Drink" or if near a lab but used for consumables "NOT for lab use. Food only. NO Chemicals". Signs available at http://z.umn.edu/containerlabel
- A biohazard or radioactive materials symbol is required if those materials are stored inside
- General description of contents and applicable hazards. Posting an inventory on the exterior is a best practice. Include owner, date and shelf location. This can also preserve energy and keep refrigerator contents cooler, as people may spend less time searching for items inside.
- Required storage temperature. Fridges typically are 4 C° and Freezers are either –20 C ° or –80 C°
- Contact information and instructions if the fridge is not working– Important for –80 C freezers
- Recommend posting the date of the last defrost. This helps reduce the amount of "mystery" containers, and helps you keep an eye on expiration dates or decomposition times.

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Secure Contents

- All containers must be labeled and should be tightly sealed. Corks, tinfoil, parafilm, and other "loose" caps should not be used.
- **Secondary containment is strongly recommended**. This will help you reduce spills and access materials without spilling. In case of an accident, using secondary containment limits the area and number of containers affected by the spill, making clean-up easier. In freezers, trays also help reduce the chances of bottles becoming embedded in ice or frost. It also helps to segregate materials of different hazard classes or owners.
- Corrosives that are stored in refrigerators can cause degradation of the lining and components of the equipment. If necessary to cool corrosives, store them inside another sealed container with a desiccant.

Use and Maintenance

- Ensure doors are tightly closed. Protects samples and the freezer.
- Defrosting once a year to prevent ice covering materials or interfering with the ability to shut the door tightly. An insulated cooler is useful for defrosting and unexpected equipment failure. Note– Excessive amounts of dry ice can be asphyxiating. Move to fume hood or ventilated area
- Clean the filters below - 80 C° freezers to ensure freezers do not overheat. This is NOT done by FM.
- Keep freezers full to improve operating efficiency. Even empty boxes help.
- Use back-up power outlets for storage of critical materials. All refrigerators should be plugged directly into an outlet. Do not use extension cords. Ensure exits are not blocked by your refrigerator's placement.
- Odors. Old fridges develop odors from changes to the interior plastic lining. Others may develop mold if water present. If a fridge is broken and needs to be disposed of be sure to decontaminate for any biological or radioactive materials. Then complete a pick up form to send to ReUse http://z.umn.edu/reusepickup

Fridge Explosions

Even a few milliliters of flammable liquid can generate enough vapors to cause an explosion. It is tempting to believe ethanol is safe in a standard fridge since alcoholic beverages are often refrigerated. However, alcoholic beverages are not 100% ethanol and have a higher flash point. Vodka 40% flash point is 26 C° while 100% ethanol flash point is 12 C°. Typically fridges are set to 4 C° , so this seems safe. However, the operating range of a fridge is actually 2 C° - 14 C°. Many incidents have occurred from seemingly small amounts. Description of an incident from U of Maryland says " *exploded ripping off the door… exited thru a window and landed 3 stories down…. gutted the entire lab and sent several fire fighters to the hospital. Cost of several hundred thousand dollars"*

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