Chemical safety fact sheet: Compressed gases

Various compressed gases, representing an array of hazards, are used in academic, research and operational activities on campus. All users of compressed gas cylinders must be familiar with the specific hazards and corresponding safeguards needed to work safely with their specific gases. See examples below of gases associated with a particular hazard.

- Simple asphyxiants – argon, helium, nitrogen
- Corrosive gases – ammonia, hydrogen chloride, hydrogen fluoride

fume hood or gas cabinet. All exhaust shall be directed to a treatment system designed to process the accidental release of gas.[1]

Acquisition

Frequently, hazardous gases are purchased in lecture bottle-sized, non-refillable gas cylinders, which become the responsibility of SFU to dispose of safely. Consider the following steps when ordering:

- First, check your own laboratory chemical inventory for the gas you need.
- If a very small quantity is required, and/or you are doing a trial run, arrange to borrow the gas from another laboratory, using the global search in the online inventory system.
- When ordering from a vendor, check to see if they offer the gas in refillable cylinders that can be returned to the vendor when you are finished.
- Order diluted gases to reduce the hazard where possible (e.g., hydrogen-argon mix).
- Avoid over-purchasing; order only the minimum number of gas cylinders needed at one time.

Safe handling and use

- When receiving a compressed gas delivery, read the cylinder label to confirm the gas received is the gas purchased. If the label is illegible or missing, return the cylinder to the supplier.
- Inspect delivered cylinders for obvious damage such as cuts, gouges, burn marks, corrosion and dents. Any cylinder with signs of deterioration should be tagged, removed from service and flagged to the supplier.
- Cylinders are permitted in the laboratory if they are in use or serving as a single reserve cylinder for a cylinder that is in use. Additional cylinders must be in a designated storage area.[1]
- Cylinders are considered in use when they are connected either through a regulator or through a manifold used to deliver gas.[1]
- Avoid stockpiling cylinders; arrange regular delivery with the gas cylinder supplier.
- Secure cylinders in an upright position, attached to a wall or within a cylinder storage rack. Two chains must restrain each cylinder: one placed at one third from the top and the other placed at one third from the bottom. See figure 2.
- Do not use bench clamps or straps and fasteners that rely on friction, as they are not expected to resist a seismic event. All restraints must be non-combustible.
- Laboratory cylinders less than 46 cm (18 inches) tall, such as lecture bottles, should be placed in approved stands, wall brackets, cylinder racks or cabinets.
- Each point of supply and each point of use of cylinders or piping system must be labelled with the gas name and a manual shut off valve.[1]
- Keep valve protection cap in place (for cylinders designed to accept a cap) when cylinder is not in use and anytime the cylinder is being moved.
- Do not deface or remove cylinder labels.

in two steps. See figure 4. Generally, a single-stage regulator is good for short duration applications; a two-stage regulator is good for long duration applications, such as gas chromatography. Be aware that the output of a single stage regulator will rise as the tank drains.

Always use the proper regulator for your gas cylinder. Consult a CGA fitting guide (e.g., from Praxair) that specifies the CGA fitting number corresponding to your gas and type of cylinder. This ensures regulator construction material is compatible with the gas and prevents gas mix-ups.

Many lecture bottles use universal threads and valves, some of which are interchangeable. All equipment used for a specific gas in your laboratory should be labelled to prevent unintentional mixing.

Follow these steps to install and operate a regulator:

- Unless specified by the manufacturer, do not use lubricant or Teflon® tape on cylinder valves, fittings or regulators. Lubricant may react with some gases (e.g., oxygen) and Teflon® tape may cause the threads to spread and weaken, and bits of tape can plug up lines, increasing the likelihood of leaks.
- With the regulator in hand, turn the pressure adjustment knob (large knob shown in the middle of figure 5)

- To shut down the system, first close the cylinder valve. Allow the pressure to bleed off until both cylinder and delivery pressure gauges read zero, then back out the pressure adjustment knob counterclockwise and close the flow control valve.
- Slowly disconnect the process or instrument fitting. Slowly remove the regulator assembly from the cylinder, bearing in mind that a small amount of gas might be trapped in the fitting. Recap the cylinder.

Moving cylinders

Have cylinders moved to and from your lab by the gas cylinder supplier whenever possible. If you must move a cylinder, take the following precautions:

- Close the [illegible]

Fire

If safe to do so, relocate away from the fire any gas cylinders not directly involved in the fire as quickly as possible. Gas cylinders which have been exposed to a fire or to excessive heat should not be used or moved. Even after a fire has been extinguished, some cylinders exposed to fire can explode. Advise the supplier and have the cylinder replaced.

References

1. British Columbia Building Safety Standards Branch. (2018). British Columbia Fire Code 2018. Retrieved from www.bcpublications.ca (accessed July 18, 2019)
2. Concordia University (2016). Compressed Gas Safety Manual. Retrieved from https://www.concordia.ca/content/dam/concordia/services/safety/docs/EHS-SOC-126_CompressedGasesSafetyManual.pdf (accessed June 12, 2019)
3. National Research Council (U.S.). (2011). Prudent practices in the laboratory: Handling and management of chemical hazards. Washington, D.C: National Academies Press.