

## Working Safely with Compressed Gases

### Compressed Gas Definition

- Any material or mixture having in the container, an absolute pressure exceeding 40 psi at 70 °F (21.1 °C); or
  - A gas or mixture of gases having an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C); or
  - Any liquid material having a vapor pressure exceeding 40 psi at 100° F (37.8 °C).
- There are three major groups of compressed gases: **liquefied**, **non-liquefied** and **dissolved gases**.



### Hazardous Properties

All compressed gases are hazardous because of the high pressures inside the cylinders.

- ❖ **Inerts** displace oxygen causing simple asphyxiation. (e.g., nitrogen, argon, and helium)
- ❖ **Toxics** cause adverse health effects depending on the type of gas, route of entry, and dose. (e.g., phosgene, CO)
- ❖ **Flammables** cause fire or explosion when ignited. (e.g., Acetylene, CH<sub>4</sub> and H<sub>2</sub>)
- ❖ **Reactives** can be subdivided into:
  - **Corrosives** that erode and deteriorate human flesh, or equipment. (e.g., ammonia, hydrogen chloride, chlorine, and methylamine)
  - **Oxidizers** that are not flammable by themselves, but which react violently with flammable or combustible materials. (e.g., gases containing oxygen at higher than atmospheric concentrations (23 -25%), nitrogen oxides, and halogen gases such as chlorine and fluorine.)



Compressed gas can have one or more hazardous properties.

### Do's for Storage, Use and Handling Compressed Gases

- ✓ Do protect cylinders from sources of direct sunlight, heat, ignition, oil, grease, or where might become part of an electric circuit.
- ✓ Do group cylinders by property of gases, e.g., store flammable gases at least 20 feet away from oxidizers gases.
- ✓ Do use designed chemical hoods for corrosive, toxic and flammable gases. Corrosive gases should be used only in locations with access to safety showers and eyewash stations.
- ✓ Do segregate full cylinders from empty cylinders to assigned areas. Always mark empty cylinders.
- ✓ Cylinders should be secured with heavy-duty chains, at about 1/3 and 2/3 the height of the cylinders. Cylinder clamps should be anchored to a wall or fixed lab bench.
- ✓ Keep the valve protection cap on securely unless the pressure regulator is attached. Only use the approved pressure regulators for the given gases. The valves should be closed when not in use.
- ✓ Move cylinders with protection cap in vertical secured position by using a specifically designed hand truck, even for short distance.
- ✓ Always perform a check of your equipment and cylinders to look for possible leaks.
- ✓ The quantity and size of cylinders in laboratory should comply with NFPA storage regulations.



### Don'ts When Handling Compressed Gases

1. Do not accept cylinders with unidentifiable contents from the vendor.
2. Never attempt to repair cylinders, valves or safety relief devices.
3. Do not empty a cylinder completely. This will help prevent cylinder contamination.
4. Do not transport cylinders in personal vehicles, or any vehicles without proper design and placard for cylinders.



Visit **Research Safety** Website for More information on Handling Compressed Gas Cylinders:

<https://www.clemson.edu/research/safety/manuals/labSafety/cylinders.html#Compressedgascylinders>