

# Compressed Gas Safety Training

for Laboratorians



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# Regulation

- OSHA Hazardous Materials standard 29 CFR 1910 Subpart H
  - Understand the hazards associated with compressed gases
  - Learn how to effectively manage these hazards
  - Learn NCCU policies regarding compressed gas use

# Compressed Gas

- OSHA definition
  - A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 °F (21.1 °C); or
  - A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C); or
  - A liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM D-323-72.
- A compressed gas cylinder is any cylinder specifically designed to contain gases under pressure of greater than one atmosphere and having the ability dispense the gas through a control valve mechanism to assure the safe and proper use of the gas at the point of operation



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# Compressed Gas Hazards

- Compressed gases can cause
  - Fires or explosions
  - Oxygen deficient atmospheres
  - Toxic gas exposures
- Compressed gas cylinders create physical hazards
  - Damaged cylinders can become uncontrolled missiles if valve breaks and releases gas rapidly



# About Compressed Gas

- Special storage, use and handling and disposal procedures are necessary to ensure employee and environmental safety
- Compressed gasses must be included in the lab's chemical inventory
- The compressed gas hazard symbol must be included on lab hazard communication signage



# Labels

- All cylinders must have a label that clearly identifies the contents
  - Do not accept a cylinder from a vendor if the contents are not clearly identified
  - If labeling cannot be read, return to vendor marked “contents unknown”



# Cylinder Storage

- Must be stored in an upright position and supported at all times whether full or empty
  - Secure cylinder above its center of gravity ( $\approx 2/3$  up the cylinder)
- Do not store at a temperature  $>125^{\circ}\text{F}$
- Do not store in cold rooms due to lack of exhaust
- Do not allow a flame to come in contact with any part of a compressed gas cylinder

# Cylinder Support

- Acceptable methods of supporting cylinders
  - Wall- or bench-mounted gas cylinder bracket
  - Chain or belt anchored to wall or bench
  - Dollies or carts designed for gas cylinder equipped with safety chains or belts
- Securing individual cylinders is ideal
  - Maximum of two cylinders may be “ganged” together at a time



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# Checking Cylinders

- Visually inspect to make sure cylinders and valves are in safe condition
- If a cylinder is discovered leaking, move it to a safe place if it is safe to do so and contact EHS and vendor
- Never attempt to repair a cylinder or valve

# Transporting Cylinders

- Always ensure valve cap is securely fastened before moving
- Use appropriate dollies or hand trucks to move cylinders weighing < 50 pounds
- Never roll or drag a cylinder
- Improper handling can weaken the cylinder



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# Regulators and Gauges

- Pressure regulators and gauges must be compatible with the valve
- Do not use “cheaters” (adapters) to force a regulator or gauge to fit
- Compressed Gas Association use standard outlet connections to prevent mixing of incompatible gases
  - If you have to force it to fit, it is probably the wrong valve!



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# Regulators and Gauges

- All connections should be checked with a soap solution for leaks – never oil or grease
  - Except cylinders containing oxygen
- Check threads on cylinder valve, regulators and other fittings to make sure they are not worn or damaged

# Lecture Bottles

- Small compressed gas cylinders
  - 12-18 inches long
  - 2-3 inches in diameter
  - Typically non-returnable
- Must be secured during use



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# Hydrogen and Acetylene



- Hydrogen is colorless, odorless, tasteless gas
- Acetylene is colorless with distinctive garlic odor
- Both are flammable
  - Mixing of either with oxygen or air in a confined area will result in an explosion if ignited by spark, flame or other source of ignition
- Storage and use areas for these two gasses must be placarded:

**HYDROGEN/ACETYLENE**

**- FLAMMABLE GAS -**

**- NO SMOKING -**

**- NO OPEN FLAMES -**



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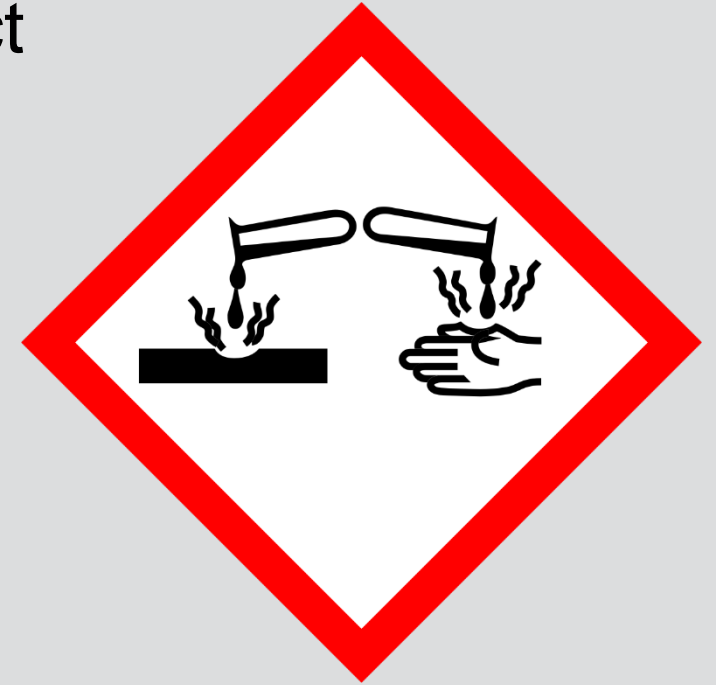
# Oxygen

- Colorless, odorless, tasteless gas
- Greatly accelerates combustion
- Never store near
  - Flammable gasses
  - Greasy or oily materials
- **DO NOT TEST CONNECTION WITH SOAP BASED LEAK DETECTOR**



# Corrosive Gases

- Can burn and destroy body tissue on contact
- Corrode metals
- Common corrosive gases
  - Ammonia
  - Hydrogen chloride
  - Chlorine
  - Methylamine



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# Cryogenic Gasses

- Examples are dry ice and liquid nitrogen
- Contact with eyes or skin can cause frostbite
- Special PPE required
  - Insulating gloves
  - Rubber aprons
  - Face shield
- Asphyxiation may be an issue
  - As liquid converts to gas tremendous pressure builds
  - Dependent on size of room and volume of gas



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# Dangerous Gasses

- Any gas that may cause significant acute health effects at a low concentration
- Include
  - Ammonia
  - Carbonyl sulfide
  - Hydrogen cyanide
  - Hydrogen sulfide
  - Methylamine
  - Nitric oxide
- If you possess or plan to possess any of these gases contact EHS for evaluation and training

# Compressed Gases in Fume Hoods

- Toxic gases (i.e. carbon monoxide) should be stored and used in a chemical fume hood
- Fume hood face velocities provide insufficient protection against pressurized gas leaks
- Use the smallest possible returnable cylinder with the lowest cylinder pressure
- Use a flow restricting orifice/needle valve to restrict flow
- Place the cylinder in the rear of the hood and keep all purge lines and gas supply lines within the hood

# Disposal

- Most used cylinders can be returned to supplier
- Disposal of non-returnable used gas cylinders is costly due to hazardous nature of the return
- Before purchasing non-refundable cylinders consult with EHS for alternate options and to determine a disposal plan



# Questions

To complete this training you are required  
to pass a short quiz with a score of 80%  
or greater

[Click here](#) to begin

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