

GLASSBLOWING BENCH

STANDARD OPERATING PROCEDURE

Prepared by: Annelise Thompson

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Principal Investigator: Nate Lewis

Section 1: Purpose

This document describes the standard operating procedures for using the glassblowing bench in Noyes 217.

Section 2: Application

The glassblowing bench is used to seal glass or quartz ampules and round the edges of tubes for electrodes and chemical vapor deposition. Glassblowing requires the use of a controlled methane/oxygen flame or hydrogen/oxygen flame to heat glass and quartz respectively.

Section 3: Equipment, Chemicals and Supplies

Hydrogen gas (H_2 , >99%) and oxygen gas (O_2 , >99%) are purchased from Air Liquide in compressed gas cylinders stored in Noyes 217. Natural gas is piped into the room separately from the house CH_4 source. Fused quartz tubes and glass tubes are purchased from GM Associates.

Section 4: Personal Protective Equipment

Due to the hazards associated with open flames, all possible precautions must be taken to ensure safety. The following equipment should be used:

- Safety glasses are mandatory. Tinted glasses or goggles should be used when working with glass at or near its melting point to avoid exposure to harmful UV radiation
- Flame-resistant or nonflammable lab apron or lab coat are recommended.
NO LAB COATS CONTAINING POLYESTER SHOULD BE WORN AROUND AN OPEN FLAME.
- Gloves
 - Steel woven gloves should be worn to protect against cuts due to carelessly broken glass
 - No nitrile gloves! *CAUTION: If you wear inappropriate gloves, they can melt and fuse to underlying skin. DO NOT wear nitrile gloves.*
- Closed-toe shoes (no sandals) and pants (no shorts).

Section 5: Operational Procedures

Note: Application of heat to glass can result in sudden breakage. Researchers should wear a lab coat and goggles whenever applying heat to glass.

1. Wear proper safety attire (described in section 4) and prepare working area in the hood.
2. Locate the safety shower, and eye wash.
3. The proper way to break glass is to first score along the intended break point and then to apply even pressure to achieve a clean break.
4. To light the appropriate flame, the gas valves should be opened although the valves in the actual glassblowing flame nozzle should remain closed.
5. When a CH₄/O₂ flame is used, the natural gas line through the nozzle should be opened and lit first before oxygen is allowed to flow through the nozzle. When a H₂/O₂ flame is used, the H₂ should carefully be lit first before oxygen is added to the flame.
6. Once the flame has been focused to a fine line, the glass or quartz should be carefully passed through the flame until the desired shape is created.
7. When glassblowing is complete, the flame should be extinguished, all gas tanks shut, and any broken glass cleaned up.

Section 6: Primary Hazards

Hydrogen gas

Hydrogen is highly explosive in mixtures of 4%-74% hydrogen by volume with air and burns with an invisible flame. The gas cylinders contain gas under pressure and may explode if heated. If left open, the hydrogen may displace oxygen and cause rapid suffocation.

Oxygen gas

Oxygen is an oxidizing gas and vigorously accelerates combustion. Keep away from oils or grease. Rescue personnel should be aware of the extreme fire hazards associated with oxygen-enriched (greater than 23%) atmospheres, and that self contained breathing apparatus (SCBA) may be required.

Natural gas

At high concentrations, inhalation can produce dizziness, headache, lack of coordination and drowsiness. It is a simple asphyxiant: if the gas displaces enough oxygen, it may cause suffocation. Odor may cause more sensitive individuals to feel nauseous.

Section 7: Engineering Controls to Prevent and Mitigate Hazards

All glassblowing operations must be performed at the glassblowing bench, which is close to an eye wash station and shower. All broken glass should be removed from the workstation. Hydrogen cylinders are not to be stored within 20 feet of any oxygen cylinders. No sources of hydrogen should be nearby when one is working with an open flame or any other ignition source. The hydrogen tank should be shut off at the main

valve whenever hydrogen is not in use to prevent leaks, which may lead to a fire or explosion hazard. Open flames should never be left unattended.

Section 8: First Aid and Emergency Procedures

Eye contact

No adverse effects expected

Skin contact

No adverse effects expected

Ingestion

Not a likely route of exposure

Inhalation

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus should be worn. IN ADDITION, RESCUERS MUST BE MADE AWARE OF HIGH POTENTIAL FOR FIRE AND EXPLOSION.

Remove victim to fresh air as quickly as safely possible. If not breathing qualified personnel should administer artificial respiration. Get medical attention.

Fire

In case of fire, evacuate immediately and call x5000.

In Case of Hydrogen Fire

Evacuate all personnel from danger area. Immediately cool container with water spray from maximum distance, taking care not to extinguish flames. If flames are accidentally extinguished, explosive re-ignition may occur. Stop flow of gas if without risk while continuing cooling water spray.