**Standard Operating Procedure for Laboratories**

**FLUORINE**

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| Department: | Click here to enter text. |
| Principal Investigator(s): | Click here to enter text. |
| Lab Manager/Coordinator: | Click here to enter text. |
| Location of Experiment:  (Building/Room Number) | Click here to enter text. |
| Lab Phone: | Click here to enter text. |
| Office Phone: | Click here to enter text. |
| Emergency Contact: (Name/Phone) | Click here to enter text. |

**Reviewed and Approved by**:

|  |  |  |
| --- | --- | --- |
| PI: (Typed Name) | Click here to enter text. | |
| PI: (Signature and Date) |  | Click here to enter a date. |
| Lab Manager: (if PI unavailable) |  | Click here to enter a date. |

**Hazardous Material Use and Management**

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| Hazardous Material(s) Used: (wt./volume) | Fluorine:  Concentration:  Maximum amount allowed without PI approval: |
| Hazardous Material Storage Location: | Store away from direct sunlight in a dry, cool and well-ventilated area. Store away from acids, alkalies, reducing agents and combustibles. Keep container tightly closed and sealed  until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling. Cylinder temperatures should not exceed 52 °C (125 °F).  Designated Storage Area: |
| Experimental Procedure and Lab Techniques to be Used: | Lab must have written procedure for cylinder purge, set up and swap. |
| Hazard Identification: (i.e., physical/health hazards) | **CAS # 7782-41-4**  **GHS Classification: Oxidizing gas under pressure. Acutely Toxic. Extremely reactive. Cause skin corrosion, and eye damage. Corrosive to respiratory tract.**   * Poison gas. * Skin, eye and mucous membrane irritant. * A most powerful caustic irritant to tissue. * May be fatal if inhaled. * Reacts violently with many materials. * Reacts explosively with ammonia, nitric acid, silver cyanide, sodium acetate, stainless steel, water, etc. * Reacts to form explosive products with alkanes, perchloric acid, potassium hydroxide, etc. * Ignites on contact with acetylene, ceramic materials, halogens, metal, metal salts, etc.   OSHA PEL: TWA 0.1ppm (0.2mg/m3)  ACGIH TLV: 1ppm, STEL 2ppm  NIOSH REL: TWA 0.1ppm (0.2 mg/m3)    Review MSDS/SDS prior to working with chemical. |
| Engineering Controls: (chemical fume hood, biosafety cabinet, glove box) | Handle only in areas with extensive venting capabilities,  preferably a gas handling cabinet. Fluorine gas handling equipment must be cleaned of oxygen. Equipment must be dry, degreased and purged with dry nitrogen or other inert gas and meticulously leak checked before connecting cylinder to system. Open valve slowly. Keep valves and fittings free from oil and grease. Use only equipment of compatible materials of construction. Use only with equipment passivated before use. Most metals form a passive fluoride film with low pressure fluorine that protects the metals from further corrosion. Avoid repeated bending of piping. This can result in flaking of protective fluorine film, resulting in a rupture of the metal. Ground all electrical lines and equipment.  All lines and equipment should be pretested for leaks with dry nitrogen. In addition, detection devises should be considered for monitoring small concentrations of fluorine in air (contact REHS for assessment).  Eyewash and safety showers must be readily available. |
| Protective Equipment: | Neoprene gloves should be worn to protect against fluorine and also against films of hydrofluoric acid, which may be formed by escaping fluorine reacting with moisture. Make sure that gloves are clean and free from grease or oil. Always check with glove manufacturer for more info.  Wear tightly sealed safety goggles. Metal frame glasses are preferred rather than plastic to eliminate the possibility of the frames catching fire. Face shield is recommended.  Wear flame resistant lab coat, full length pants and closed-toe shoes. |
| Waste Collection/Disposal Method: | Empty gas cylinders should be returned to the compressed gas distributer. Make sure that valve protection cap is in place. Do not attempt to dispose of residual waste or unused quantities of fluorine gas.  Store all other fluorine waste in tightly closed one-quart container, in secondary containment and in a designated location inside a fume hood. Store waste away from incompatible waste.  Affix and complete hazardous waste label.  Contact REHS for waste pick up: <https://halflife.rutgers.edu/forms/hazwaste.php> |
| Spill Management: | Evacuate personnel to safe areas. Keep people away and upwind of spill/leak. Ensure adequate ventilation. Shut off all ignition source. Use personal protective equipment. Avoid contact with skin, eyes and clothing.  If possible without risk, stop the gas flow, check cylinder valve and cylinder.  Contact REHS. |
| First Aid: | **Eyes**: Immediately flush eyes with plenty of water for 15 minutes. Keep eye wide open while rinsing. Seek immediate medical attention.  **Skin**: Flush skin with soap and plenty of water for 15 minutes while removing all contaminated clothing and shoes. Dermal burns may be treated with calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides  in an insoluble form and limits burn extension and pain. Seek immediate medical attention.  **Inhalation**: Move person to fresh air, if breathing is difficult give oxygen. Seek immediate medical attention.  **Ingestion**: product is a gas, so ingestion is not probable. |

**Training**

* Prior to conducting any work with fluorine, designated personnel must be provided training specific to the hazard involved in working with the substance.
* The PI must provide his/her lab personnel with a copy of the SOP and a copy of the SDS provided with the manufacturer.
* The PI must ensure that his/her lab personnel have attended and are up to date on the appropriate laboratory safety training within the last year.

I have read and understood the content of this SOP and the SDS:

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| --- | --- | --- |
| Lab Personnel  (Running the Experiment) | Date of Hands-on Training from Department | Signature of Lab Personnel |
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**FLUORINE**

**Oxidizing gas under pressure. Acutely Toxic. Extremely reactive. Cause skin corrosion, and eye damage. Corrosive to respiratory tract.**

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**FIRST AID**

**Delayed effects may occur**

**Eyes**: Immediately flush eyes with plenty of water for 15 minutes. Keep eye wide open while rinsing. Seek immediate medical attention.

**Skin**: Flush skin with plenty of water for 15 minutes while removing all contaminated clothing. Dermal burns may be treated with calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides in an insoluble form and limits burn extension and pain. Seek immediate medical attention.

**Inhalation:** Move person to fresh air, if breathing is difficult give oxygen. Seek immediate medical attention.

**Ingestion**: product is a gas, so ingestion is not probable.

**DIAL 911 Call REHS for more information 848-445-2550**