Standard Operating Procedure

Phosphorus

*This is an SOP template and is not complete until: 1) lab specific information is entered into the box below 2) lab specific protocol/procedure is added to the protocol/procedure section and
3) SOP has been signed and dated by the PI and relevant lab personnel.*

 Print a copy and insert into your
*Laboratory Safety Manual* and *Chemical Hygiene Plan*.
Refer to instructions for assistance.

|  |  |
| --- | --- |
| **Department:** | Click here to enter text. |
| **Date SOP was written:** | Click here to enter a date. |
| **Date SOP was approved by PI/lab supervisor:** | Click here to enter a date. |
| **Principal Investigator:** | Click here to enter text. |
| **Internal Lab Safety Coordinator/Lab Manager:** | Click here to enter text. |
| **Lab Phone:** | Click here to enter text. |
| **Office Phone:** | Click here to enter text. |
| **Emergency Contact:** | Click here to enter text. |
| *(Name and Phone Number)* |
| **Location(s) covered by this SOP:** | Click here to enter text. |
| *(Building/Room Number)* |

**Type of SOP:** [ ]  Process [x] Hazardous Chemical [ ]  Hazardous Class

**Purpose**

Depending on its form, phosphorus can be **highly flammable** or explosive, and when exposed to air, **pyrophoric**. It is explosive when mixed with oxidizing substances. It can be highly **toxic**. Phosphorus exists in different forms with very different properties. The two major forms are white and black. White phosphorus is the least stable, the most reactive and the most volatile while black phosphorus is the least reactive.

**White phosphorus**: Explosive when mixed with oxidizing substances and spontaneously flammable in air. Can cause severe burns and risk of serious damage to eyes. Is very toxic by inhalation and if swallowed.

**Black phosphorus:** Stable form of phosphorus at room temperature and pressure. May be harmful by inhalation, ingestion, or in contact with skin and eyes. It is not explosive or flammable in air.

Phosphorus is used as an additive in semiconductors and electroluminescent coatings. A large proportion of phosphorus is used in fertilizers.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: N/A

Class: **Possible acute toxin, potentially highly flammable or pyrophoric**

Molecular Formula: P

Form (physical state): Solid

Color: N/A

Boiling point: N/A

**Potential Hazards/Toxicity**

Depending on its form, phosphorus can be **highly flammable**. It is explosive when mixed with oxidizing substances. It can be highly **toxic**. Phosphorus exists in different forms with very different properties. The two major forms are white and black. White phosphorus is the least stable, the most reactive and the most volatile while black phosphorus is the least reactive.

May cause skin or eye irritation. May cause irritation of the digestive tract. May cause central nervous system depression. Ingestion of very large amounts may cause generalized depression, headache, and drowsiness. May cause respiratory tract irritation. May cause respiratory injury to persons with preexisting respiratory conditions or disease.

No permissible exposure limit data is available.

No acute toxicity data is available.

**Personal Protective Equipment (PPE)**

**Respirator Protection**

Use a full-face particle respirator with type N100 (US) respirator cartridges.

Respirators should be used only under any of the following circumstances:

* As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
* When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
* Regulations require the use of a respirator.
* An employer requires the use of a respirator.
* There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL).
* As PPE in the event of a chemical spill clean-up process.

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

**Hand Protection**

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with phosphorus.

Refer to glove selection chart from the links below:

<http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf>

OR

<http://www.allsafetyproducts.biz/page/74172>

OR

<http://www.showabestglove.com/site/default.aspx>

OR

<http://www.mapaglove.com/>

**Eye Protection**

ANSI-approved, properly-fitting safety glasses or chemical splash goggles. Face shield is also recommended.

**Skin and Body Protection**

Flame-resistant lab coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Full-length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle should not be exposed.

**Hygiene Measures**

Wash thoroughly and immediately after handling. Remove any contaminated clothing and wash before reuse.

**Engineering Controls**

Handle using a chemical fume hood with good ventilation and electrically grounded lines and equipment.

**First Aid Procedures**

**If inhaled**

Move into the fresh air immediately and give oxygen. If not breathing give artificial respiration. Seek medical attention immediately.

**In case of skin contact**

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Seek medical attention immediately.

**In case of eye contact**

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention and continue eye rinse during transport to hospital.

**If swallowed**

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek medical attention immediately.

**Special Handling and Storage Requirements**

**Precautions for safe handling:** White phosphorus is highly **flammable** and explosive in air, **pyrophoric**. Keep away from heat, sources of ignition, shock or friction. Avoid contact with skin and eyes and inhalation. Avoid inhalation of vapor or mist. Avoid formation of dust.

**Conditions for safe storage:** White phosphorus is highly **flammable** and explosive in air, **pyrophoric**. Keep away from heat, sources of ignition, shock or friction. Keep in a dry place. Keep container tightly closed in a cool, dry, and well-ventilated space. Keep away from incompatible materials and conditions. Keep cool and protect from sunlight.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

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# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends and Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life-Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

Use proper personal protective equipment and properly dispose chemical.

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure (Add lab specific Protocol/Procedure here)**

Click here to enter text.

**NOTE**

Any deviation from this SOP requires approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with phosphorus, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

**Principal Investigator SOP Approval**

Print name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Approval Date:

I have read and understand the content of this SOP:

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
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