#1 CONTACT INFORMATION:

<table>
<thead>
<tr>
<th>Procedure Title</th>
<th>Oxygen Plasma Prep Cleaner User Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure Authors</td>
<td>Jeffrey B. Tok &amp; Jeffrey Weiss</td>
</tr>
<tr>
<td>Date of Creation/Revision</td>
<td>6-1-2011</td>
</tr>
<tr>
<td>Name of Responsible Person</td>
<td>Jeffrey B. Tok</td>
</tr>
<tr>
<td>Location of Procedure</td>
<td>Nano Bldg, Rm 008</td>
</tr>
<tr>
<td>Approval Signature</td>
<td>(If required. See section #10 of this template)</td>
</tr>
</tbody>
</table>

#2 THIS STANDARD OPERATING PROCEDURE (SOP) IS FOR A:

- Specific laboratory procedure or experiment
  Plasma Prep O2 cleaner

- Generic laboratory procedure that covers several chemicals
  Examples: distillation, chromatography, etc.

- Generic use of specific chemical or class of chemicals with similar hazards
  Examples: organic azides, mineral acids, etc.

#3 PROCESS OR EXPERIMENT DESCRIPTION

Provide a brief description of your process or experiment, including its purpose. Do not provide a detailed sequential description as this will be covered by section #6 of this template. Indicate the frequency and duration below. [PRECEDING GUIDANCE TEXT MAY BE DELETED.]

| Frequency:                  | one time  daily  weekly  monthly  |
|-----------------------------|-----------------|-----------------|-----------------|
|                             | other:____________|
| Duration per Expt:          | 30-40 minutes; or hours |
### SAFETY LITERATURE REVIEW & HAZARD SUMMARY


### STORAGE REQUIREMENTS

n/a

### STEP-BY-STEP OPERATING PROCEDURE

<table>
<thead>
<tr>
<th>Step-by-Step Description of Your Process or Experiment</th>
<th>Potential Risks if Step is Not Done or Done Incorrectly (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong>: Don personal protective equipment.</td>
<td></td>
</tr>
<tr>
<td>☑ appropriate street clothing (long pants, close-toed shoes)</td>
<td></td>
</tr>
<tr>
<td>☐ gloves; indicate type: ____________________________</td>
<td></td>
</tr>
<tr>
<td>☐ safety goggles ☑ safety glasses ☐ face shield</td>
<td></td>
</tr>
<tr>
<td>☑ lab coats ☐ other: ________________________________</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong>: Check the location/accessibility/certification of the safety equipment that serves your lab including fume hoods, safety showers, spill kits, fire extinguisher, etc.</td>
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</tr>
<tr>
<td><strong>Step 3</strong>: Introduction:</td>
<td>0₂ gas hazards- oxidizer, increases flammable potential, compressed gas, etc.</td>
</tr>
<tr>
<td>The Plasma Prep 5 O₂ plasma generator is used for cleaning inorganic substrates. NO BULK ORGANIC SAMPLES ARE ALLOWED IN THE CHAMBER. Users should read the manual to become familiar with the system and its capabilities. Briefly, the system comprises the plasma generator unit complete with gas handling and timing components, a mechanical pump outfitted specifically for O₂ plasma exhaust, and a source of high purity O₂. The base pressure of the system is 0.2 mbar, and the operating pressure window is 0.3 – 4 mbar. The power can be adjusted from 10-100W. The generator was designed to handle two separate gases while in operation, but the Gas 2 flow control valve is damaged, so only one</td>
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</table>
gas can be used.

**Safety Precautions:**
1. Wear eye protection.
2. Ensure the exhaust line of the vacuum pump is interfaced with the lab air exhaust system (fume hood or snorkel hood).

**Operation:**
1. Sign the logbook.
2. Open the main valve on the O₂ cylinder. Ensure the exit pressure on the regulator is around 15 psi.
3. Turn on the power to the plasma generator system (red rocker switch on the front).
4. Press the “Ventilation” button. (button will turn green)
5. When vented, remove the hatch and carefully place on top of the instrument.
6. Load samples into the chamber.
7. Replace hatch, and while pressing on the hatch, press the “Ventilation” button again (to deactivate the vent) and then press the “Pump” button.
8. Once the system has reached the interlock pressure (0.3 mbar), the timer and gas flow controls will become operable. Depress the “Gas 1” button to activate the flow of O₂ (button will turn yellow).
9. Open the Gas 1 flow control valve and adjust to achieve the desired chamber pressure.
10. Set the “Power” dial to the desired setting (10-100W).
11. Set the “Timer” for the desired duration.
12. Press the “Generator” button (button will turn red).
13. When the timer runs out, the generator will automatically shut off. Press the “Gas 1” button to deactivate gas flow.
14. Close the Gas 1 flow control valve (Finger tighten only!)
15. When the pressure is 0.3 mbar or below, press the “Pump” button to deactivate the pump.
16. Press the “Ventilation” button.
17. When vented, remove the hatch and carefully place on top of the instrument.
18. Remove samples.
19. Replace hatch, and while pressing on the hatch, press the “Ventilation” button again, and then press the “Pump” button.
20. When the pressure gauge begins to move, press the “Pump” button to deactivate the pump.
21. Turn off the power to the instrument (red rocker switch).

**Caring for the Instrument**
1. No organic samples are allowed in the chamber (i.e. PET, PDMS, plastic containers, photoresist or other thick polymeric coatings). Over exposure to organics can cause debris to build up inside the chamber and redeposit during successive cycles. Keep it clean for everyone.
2. The oil in the pump is specifically designed for O₂ plasma exhaust. NEVER fill the pump with standard mechanical pump
oil. Use only Fomblin YL VAC 25/6.

3. The hatch is affixed to the plasma generator housing by a cord. Do not remove this cord as the hatch can fall when the chamber is vented.

4. Run the instrument for at least 5 minutes when finished to clean the chamber for the next user.

5. NEVER over-tighten the gas flow control valve.

Tips and Tricks

1. Before running your sample, do a dry run to ensure the plasma is the correct color. An O$_2$ plasma will be a white-blue color. If the plasma is pink or purple, this is an indication of either too much N$_2$ or C in the chamber. Try pumping the chamber longer, flooding the chamber with O$_2$ (at a pressure of 3 mbar), and/or letting the generator run until the plasma turns the proper color.

2. Small samples will become airborne upon venting if placed directly on the bottom of the chamber. Consider using a small glass petri dish or watch glass to hold your samples inside the chamber (remember, NO PLASTICS!).

3. If the instrument has not been run for a few days, the pressure in the dead volume of the gas lines will rise. When the “Gas 1” button is depressed for the first time after reaching the base pressure, a rush of gas will cause the chamber pressure to spike over 4 mbar, causing the gas controls and timer to be deactivated. Do not despair. Simply wait for the system to reach base pressure again, at which point the gas controls will be reactivated. If the dead volume pressure is still too high, a spike may occur again. At some point, the pressure will stabilize, and operation can proceed as normal.

4. The plasma process can be aborted by pressing the small, yellow, “Reset” button on the timer panel.

Spent Fomblin vacuum oil should be brought back to home laboratory for disposal.

Step 4: Aqueous water waste can be disposed to sink. Collect other organic waste (if presence) into container and label accordingly. Bring back to home laboratory for disposal.

Step 5: Clean up work area and lab equipment.

Step 6: Remove PPE and wash hands.

#7 EMERGENCY PROCEDURES

A. Health-Threatening Emergencies (ex: fire, explosion, health-threatening hazardous material spill or release, compressed gas leak, or valve failure)

1. Call 9-911 (or 286 in the School of Medicine).

2. Alert people in the vicinity and activate the local alarm systems.

3. Evacuate the area and go to your Emergency Assembly Point (EAP): 106 Center of Engineering Plaza

4. Remain nearby to advise emergency responders.
5. Once personal safety is established, call EH&S at 725-9999 (or 286 in the School of Medicine).
6. Provide local notifications: Jeffrey Tok, 650-575-9884

If personnel exposed or injured:
1. Remove the injured/exposed individual from the area, unless it is unsafe to do so because of the medical condition of the victim or the potential hazard to rescuers.
2. Call 9-911 (or 286 in the School of Medicine) if immediate medical attention is required.
3. Call 725-9999 (or 286 in the School of Medicine) to report the exposure to EH&S.
4. Administer first aid as appropriate.
5. Flush contamination from eyes/skin using the nearest emergency eyewash/shower for a minimum of 15 minutes. Remove any contaminated clothing.
6. Bring to the hospital copies of MSDSs for all chemicals the victim was exposed to.

B. Non-Health Threatening Emergencies
For non-health threatening injuries and exposures
Call the Occupational Health Center at 725-5308 for more information and to schedule an appointment.

For hazardous material spills or releases which have impacted the environment (via the storm drain, soil, or air outside the building) or for a spill or release that cannot be cleaned up by local personnel:
1. Notify Stanford University responders by calling 725-9999 (or 286 in the School of Medicine). These services are available 24 hours a day, 7 days a week.
2. Provide local notifications: Jeffrey Tok, 650-575-9884
   Identify the area management staff that must be contacted and include their work and home numbers. This must include the principal investigator and may include the lab safety coordinator, facilities manager, and/or business manager. [PRECEDING GUIDANCE TEXT MAY BE DELETED]

C. Small Spills/Local Cleanup:
In the event of a minor spill or release that can be cleaned up by local personnel using readily available equipment (absorbent, available from EH&S in Small Spill Kit):
1. Notify personnel in the area and restrict access. Eliminate all sources of ignition.
2. Review the MSDS for the spilled material, or use your knowledge of the hazards of the material to determine the appropriate level of protection.
3. Wearing appropriate personal protective equipment, clean up spill. Collect spill cleanup materials in a tightly closed container. Manage spill cleanup debris as hazardous waste.
4. If greater than 30 ml, or if it will take longer than 15 minutes for you to clean up, immediately call EH&S at 725-9999 (or in the School of Medicine, x286) to report the spill, and notify your supervisor.
5. Submit online waste pickup request to EH&S.

D. Building Maintenance Emergencies (e.g., power outages, plumbing leaks):
Call Facilities Operations at 723-2281.

<table>
<thead>
<tr>
<th>#8</th>
<th>WASTE DISPOSAL</th>
</tr>
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<tbody>
<tr>
<td>n/a</td>
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</table>
**#9 TRAINING REQUIREMENTS**

**General Training (check all that apply):**
- General Safety & Emergency Preparedness (EHS-4200)
- Chemical Safety for Laboratories (EHS-1900)
- Compressed Gas Safety: EHS-1900, EHS-2200

<table>
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**Laboratory-specific training (check all that apply):**
- □ Review of MSDS for other chemicals involved in process/experiment
- ☒ Review of this SOP
- ☒ Other: __ Review of Facility Safety Protocol and Checklist

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**#10 PRIOR APPROVALS**

n/a