

## **Standard Operating Procedures**

### **Electrophoretic Deposition Apparatus**

Electrophoresis is a useful tool for deposition of various materials onto a conductive substrate. Extreme caution should be exercised when using electrophoretic deposition (EPD) as a result of the high voltages associated with this technique. The following describes the safe operating procedures for this apparatus.

#### **Using the EPD Apparatus**

1. Note the polarity indication on the label above the polarity knob. Understanding the charge of the material you wish to deposit is important to know how the material will migrate to the electrode.
2. Place your sample into one of the appropriate-sized vessels located in the storage container for EPD materials on the bench.
3. Raise the electrode holder to the highest position using the lift-roller on side of the apparatus.
4. Attach a fluorine-doped tin oxide electrode on the opposite side of the direction your sample will migrate under the applied electric field. Note the color of the leads to the terminals for determination of which of the sides is positive and negative. Use the plastic fastening screw to hold the electrode in place.
5. When the electrodes are fastened securely, use the lift-roller to slowly immerse the electrodes into the solution containing the material desired for deposition. You may need to prop the container with your material solution up on one of the many different sized props located in the EPD drawer just below the apparatus.

6. Attach the desired substrate for material deposition to the other side of the apparatus. Use the plastic fastening screw to hold the electrode in place.
7. Ensure the “High Voltage” toggle switch in the middle-bottom of the high voltage source is in the off position.
8. Set the desired voltage with the dials. Each dial is an order of magnitude higher in precision.
9. Turn the instrument on by flipping the On/Off toggle switch to the far left on the high voltage source. Wait for the light to come on near the High Voltage switch.
10. Turn on the high voltage by flipping the High Voltage switch to the on position. The light should change from white to red.
11. Wait the desired length of time for deposition. Flip the High Voltage switch back to the off position. Turn off the High Voltage source using the toggle switch on the far left. Remove electrodes using the lift-roller and by detaching them from the apparatus.
12. Clean all reusable materials including the FTO electrode and vessel used for your material.

### **Important Safety Concerns with EPD**

1. Always ensure the electrodes **DO NOT TOUCH** before turning on the High Voltage switch. **DO NOT BUMP THE APPARATUS AS THIS CAN LEAD TO THE ELECTRODES TOUCHING.**
2. Use only electrodes that are appropriate stiffness to avoid the potential of electrodes touching during deposition.

3. If the High Voltage source begins clicking, immediately turn the High Voltage switch to the off position. The solution may be too conductive. During EPD, no current is supposed to flow through the solution. Sometimes highly conductive solutions can cause this to occur.
4. Do not touch the leads.
5. If the instrument needs maintenance, consult with Professor Kamat or a senior graduate student or postdoctoral researcher before proceeding. Reasons for maintenance may include: leads not connected well, High Voltage source making sounds, or High Voltage source not turning on.