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| The University of Florida | Title: In-situ Electrical poling with P350 HV 5kV source | | |

- *Personnel performing this procedure will have training provided by the equipment manufacturer or by a trained UF personnel.*

I. PURPOSE

To establish a method for using the 5 kV high voltage device for in-situ electrical poling.

II. OUTLINE OF METHOD

The HV source will be use to pole ceramic samples in-situ during a variety of applications. Some of those applications include x-ray diffraction and while using a light-optical microscope. The ceramic sample that is being poled must be contained in an insulated device (as shown in Appendix I, Figure 1). The lead and ground wires must also be completely insulated and protected behind a guard or protection shield (as shown in Appendix I, Figure 2).

III. Resources

This is any necessary information or equipment that is needed for electrical poling of ceramics. A list of the PPE that is needed is also listed and should be closely followed. Other information is listed in the machine manual.

A. Resources (Prior knowledge and equipment)

1. High Voltage Source
2. Sample that has been coated with a conducting material on the sides that will be poled.
3. Sample Holder
4. High Voltage Safety Encasement.
5. Multi-meter
6. Manufacturer's Manual.
7. PPE
 - a. Protective Eyewear (optional)
 - b. Latex/nitrile gloves (if ceramic material should not be handled with bare hands)

IV. PROCEDURE

Always work in pairs while performing the poling procedure. The following steps are the basic procedures needed for using this device. Please insure before starting that the HV device is unplugged and the lead wires are not attached to anything (other than the back of the HV device).

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B. Preparation

1. Sample should be properly coated with a conducting material on the sides that will build up the charge.
2. You should make sure that no other side of the sample has accidentally been coated with a conductive material; this could inhibit the poling process.
3. Mark on the sample which side you want the poling direction to be in.

C. Testing

1. The sample should be placed in a proper holding/poling device to ensure user safety and that the sample will not move during poling (see Appendix I, Figure 1)
2. Place and secure the sample in its holder for testing (not for poling, but for the test that is being done at the same time as poling).
3. Double check that the HV device is **not** turned on or plugged in.
4. Place the lead wire (positive and negative/ground wire) on the appropriate sides of the sample for poling. Preferably positive on top and negative on the bottom (as shown in Appendix I, Figure 3.)
5. Place the safety enclosure around the sample holder and the HV wires, ensuring the any exposed alligator clip or metal conducting surface is enclosed with-in the safety enclosure (as shown in Appendix I, Figure 2).
6. Double check that the power button is in the “off” position (not pushed in) and that the high voltage switch is also off.
7. Plug the HV device into the wall.
8. To set the current limiter press SELECT until the LIMIT LED is on.
9. Change the displayed value by using the numeric or cursor (arrow) keys.
10. Press ENTER.
11. To set the voltage output press the SELECT button until the VOLTAGE SET LED is lit.
12. To change the value that is displayed in the center window, enter the desired voltage using the numeric or cursor keys. The VOLTAGE SET LED will be flashing, indicating that the displayed value is not the actual programmed value.
13. Press ENTER to set the voltage or CLR to clear the voltage. At this time the VOLTAGE SET LED should no longer be flashing, indicated that the voltage is set.
14. Turn the voltage power switch to the “on” position.
15. If errors occur, please see manufacturer’s manual or ask someone else what the errors mean how to clear them.

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D. Recording Data

1. Before poling, retrieve the coercive field of your sample.
2. Record the set voltage (what you set the voltage to be)
3. Record the applied/actual voltage during poling (what the display reads during poling). Note any differences.
4. Record what the current limit was set at.
5. Record the current output, as displayed by the HV device, during poling.
6. How long the sample was poled for.
7. If d33 was measured before and after poling, also record those values.

E. Clean-up

1. Make sure all wires are disconnected.
2. Using an insulated wire, short the positive side of the sample to the negative side to remove any residual sample charge.
3. Remove sample from sample holder.
4. Properly store the HV device and all wires back in the hard plastic suitcase.

F. Emergency Procedure and Shutdown

1. The voltage switch on the machine should be turned off first, followed by power button on the machine, and then followed by unplugging the device from the wall.
2. Machine can be shut down during an emergency by using the power switch, unplugging the device from the wall or by and flipping the breaker on the wall to shut down all power going to machine.
3. If someone is being electrocuted **do not touch them**. Shut the power off going to the device and try to move them away from the source by using an insulated stick (wooden broom handle) and call 911.

G. Safety Hazards

1. Never tamper with the HV device or the voltage lines.
2. **Always make sure the HV lines are enclosed with a safety box during poling.**
3. Make sure HV device is powered down before handling the voltage lines.
4. Check with a multi-meter to ensure that there is no current still flowing through the lines before touching or removing the voltage lines.

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5. High Voltage source: ELECTRICAL SHOCK HAZARD!!! Please use proper safety measures in accordance with the Standard Operating Procedure, and the manufacturer's manual.
6. Use one hand when possible to prevent against electric shock.

H. APPENDIX I

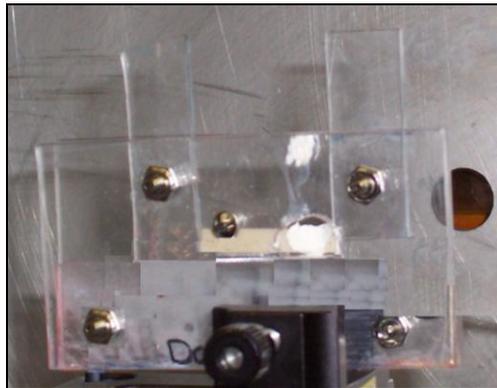


Figure 1: Example of Sample Holder

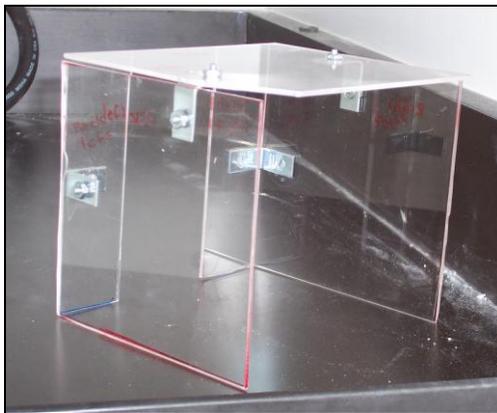


Figure 2: Example of Safety Box

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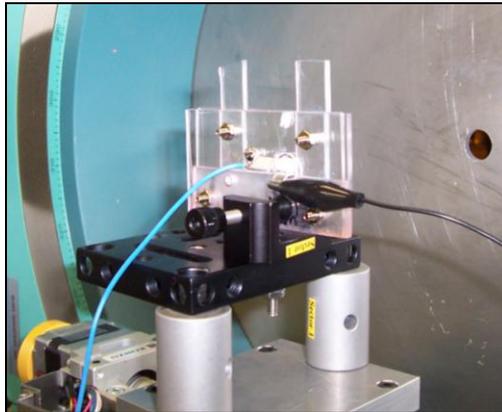


Figure 3: Example of how to connect the voltage and ground wires to sample.