Electrostatic Discharge Apparatus: Standard operating procedure

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Description

The electrostatic discharge apparatus (ESD) is used to ignite powders by means of an electric spark. A spark is generated by a high-voltage capacitor discharging over a gap between a sharpened electrode and a powder bed. Adjustable parameters include: voltage, capacitance and the quantity of sample used.

Before starting:

1) Apply appropriate Personal Protection Equipment (PPE, including nitrile gloves, lab coat, eye protection, **static safe wrist strap** and if necessary, ear protection).
2) Ensure that the work area is clear of dust, debris, material samples, and any lab components not directly used for the experiment.

Preparing the Sample Holder:

1) Place no more than 20 mg of wet powder (under hexane) into a vial.

2) Determine appropriate sample holders for your experiment. Locate and clean the sample holders.

3) Apply a small amount of silver paste on the bottom of the sample holder.

4) Use a spatula to take the wet powder out of the vial and load it into the sample holder cavity.

Discharging the sample:

1) Place sample holder with wet powder into the chamber, which slides directly into the cup electrode. Check that the sample holder is properly seated by trying to move it laterally. If it doesn't move, then proceed to step 2.

2) Lower the pin electrode so that it is approximately 2 mm above the powder surface. Tighten the screw on the top of the chamber that holds the pin electrode firmly in place.

3) Allow the powder to dry for at least 5 minutes, prior to discharge.

4) Skip to step 5 unless the experiment is being conducted in a vacuum or inert gas environment.

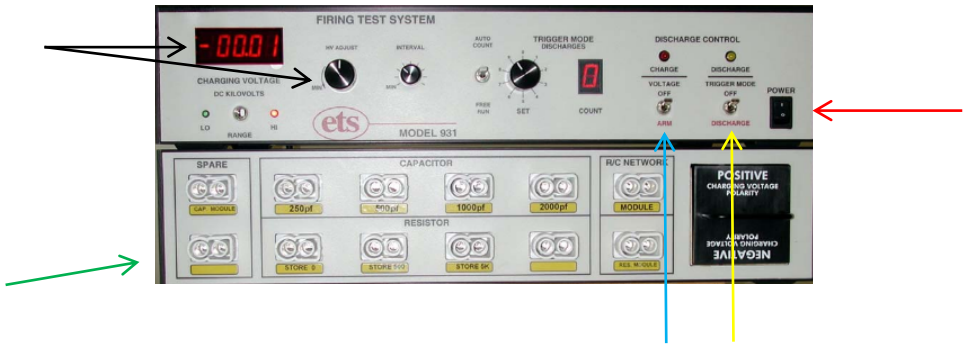
    a. Depending on the experiment, it may be desired to conduct the experiment in a vacuum or other ambient environments (argon, pure oxygen etc.) In this case, cover the openings of the chamber with the appropriate polycarbonate windows and seal them tightly using screws. Use the vacuum pump to evacuate the chamber. As necessary, fill the chamber with desired gas.

5) Turn on the firing test system by pressing the power button shown on the picture below (red arrow).

6) Select the appropriate voltage on the firing system by turning the dial until the desired voltage is displayed on the monitor (black arrows).

7) Select the appropriate capacitance from the capacitance bank (green arrow).

8) Prepare data acquisition or oscilloscope based on the experiment's objectives.



9) When the powder is ready to be sparked, hold down the "arm" toggle switch (blue arrow) and wait around 10 seconds to allow the system to charge. After the system is charged, continue to hold the "arm" switch down until you spark the powder. In order to spark the powder, press the "discharge" toggle switch (yellow arrow).

10) Save the data recorded by the data acquisition system.

11) After the discharge, loosen the screw that holds the pin electrode, and raise the pin electrode. Take out the sample holder and clean it. If necessary, clean the chamber as well.