ELECTROSTATIC VOLTAGE MEASUREMENTS ON EXPLOSIVE POWDERS

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This note gives in brief some of the results of the electrostatic voltage measurements carried out on the explosive powders developed and manufactured in Explosives Research and Development Laboratory, Pune.

Electrostatic voltages, which are developed on explosive materials due to friction, sliding or handling are dangerous as these can ignite explosives unexpectedly causing serious hazards if safe limits are crossed[1,2]. The generation of static voltages is an inherent property of an explosive and the safe limits must be known for their safe handling. Several workers[3-5] have carried out the electrostatic voltage measurements on different types of explosives under various conditions.

EXPERIMENTAL PROCEDURE

The schematic experimental arrangement used in this laboratory is shown in Fig 1. The polythene tube of 6 mm dia and 25 cm in length with a polythene funnel at top end is fixed in a metal stand. The powder is poured in the polythene funnel. It rolls down through it to the polythene tube. The powder is collected at the bottom in a small glass container (15 mm dia 3 mm depth) placed on a clean glass platform. The charged powder is flattened with a paper spatula and shifted below the electrostatic detector probe as shown in the Fig 1. A Keithley Electrometer (Model 610C) in conjunction with model 2503 Static Detector Probe is used in these measurements. The distance between the tip of the probe and the charged surface is kept $\frac{1}{4}$ inch as recommended by the manufacturer of the instrument. The experiments are carried out in the humidity and temperature controlled environments with proper electrical shielding.

RESULTS AND DISCUSSION

The results of the electrostatic voltage measurements on nitrocellulose powder with and without antistatic agent viz. Catanac SN (1% and 2%) are given in Table 1. It is seen from the results that the static voltage developed on dense nitrocellulose powder (without treatment) is—32V, whereas the nitrocellulose powder after treatment with antistatic agent like Catanac SN (1%&2%) could not develop any static voltage.

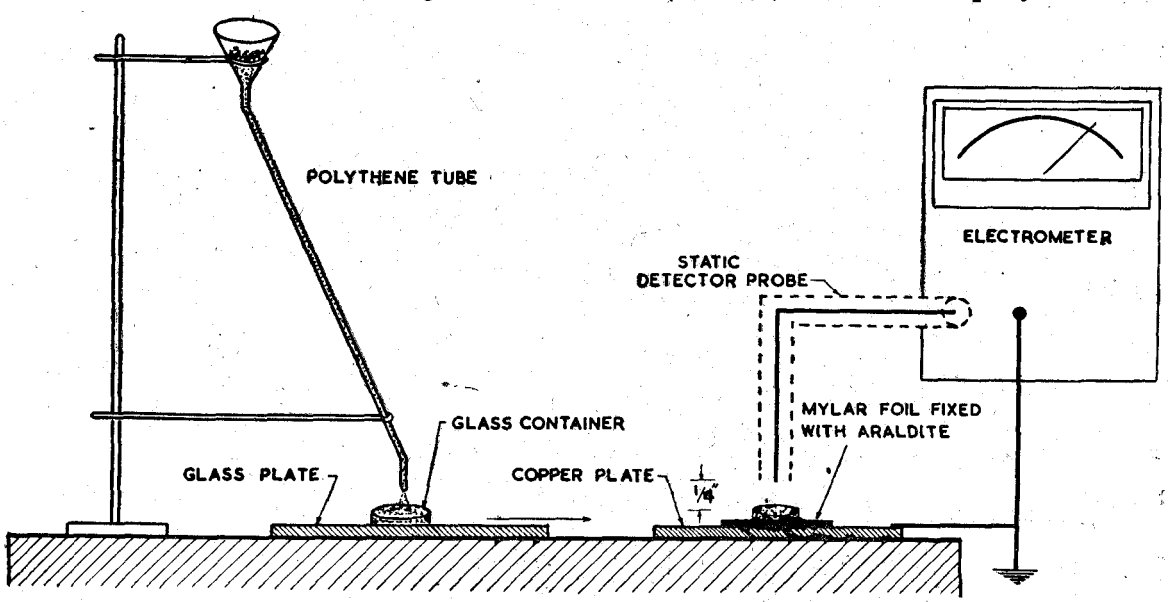

Fig. 1—Experimental set-up for static charge measurement.

TABLE 1

STATIC VOLTAGE MEASUREMENTS ON NITROCELLULOSE POWDERS

(Temp. 75°F, Relative Humidity 61%)

Powder	Total No. of readings	Average (Voltage)
Dense Nitrocellulose powder (without treatment)	41	—32V
Nitrocellulose powder with 1% Catanac SN	15	Nil
Nitrocellulose powder with 2% Catanac SN	15	Nil

TABLE 2

STATIC VOLTAGE MEASUREMENTS ON INITIATOR POWDERS

(Temp. 76°F, Relative Humidity 58%)

Powder	Total No. of readings	Average (Voltage)
Lead Styphnate	5	—127V
Lead Azide	5	+87V

The results on electrostatic voltage measurements on initiatory explosive compounds are given in Table 2.

It is clear from the results that the lead styphnate has got a tendency to develop more static voltage than lead azide. The polarity of voltage on lead azide is positive whereas on lead styphnate is negative.

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