

MONSANTO CHEMICAL COMPANY
W. G. KRUMMRICH PLANT LABORATORYSTANDARD ANALYTICAL
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11,607

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ATTACHMENTS

WGC Method 11,608

PRODUCT

Aroclors, Pyranols, and Inerteens

TEST

Resistivity

THIS FORM

☒ SUPERSEDES METHOD11,751
11,752

ISSUED ON

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☒ REVISES INSTRUCTIONSSCOPE

This method is used to determine the resistivity of Aroclors, Pyranols, and Inerteens by applying a high voltage to the material in a test cell and measuring the resistivity on a megohm bridge. This is a modification of ASTM Method D 1169-58.

EQUIPMENT

- a. The resistivity apparatus was assembled in our laboratory from the following components:
 1. Megohm bridge, resistance reading to 1,000,000 megohms, General Radio Co., Cambridge, Mass., type 544-B, or equivalent.
 2. Test electrodes, concentric nickel cylinders with feet, inner electrode is 2.8" O.D. x 3.25" high, outer electrode is 3.0" I.D. x 3.25" high, General Electric Co., Pittsfield, Mass., Cat. No. 1,559,663, Drawing No. M-651874. Refer to WGC Method No. 11,608 for cell cleaning procedure and determination of cell constants.
 3. Spacer plate, General Electric Co., Drawing No. M-651874-25.
 4. Oven, constant temperature, Fisher Isotemp, Fisher Scientific Co., St. Louis, Mo., Cat. No. 13-245, or equivalent. This oven is modified to include inner-wall connectors and set to maintain a temperature of 100 (± 0.5)°C.

The equipment is assembled by drilling a hole in the top of the oven large enough for a teflon insulated amphenol connector (CPH UG 568/4). The outside of the plug is grounded to the oven case. Alligator clips and leads are connected to the Bayonet clip so that the outside electrode is connected to the ground and the inner electrode to the insulated pin. The leads are made long enough to prevent pulling the electrodes out of position, when placed in the oven.

Type RC/U coaxial cable is used to connect the electrode leads to the megohm bridge. The inner wire is connected to the insulated plug and the outer cable to the ground side. The other end of the cable is an insulated double plug (General Radio Co. type 274 MB) with the red plug connected to the insulated section of the bayonet plug and the black plug to the outer cable.

The bridge ground is connected to the back of the oven and the oven is grounded to a cold water pipe to prevent possible shock.

- b. Thermometer, -1 to 101°C., 0.1° division, 610 mm, Fisher Cat. No. 15-000, or equivalent.
- c. Usual laboratory apparatus.

SAFETY

Chlorinated benzenes and diphenyl are irritating to the skin. The vapors of the hot materials are irritating to the eyes and upper respiratory system. If accidental contact is made with the eyes, flush immediately with a large amount of water for at least 15 minutes and get immediate medical attention. Wash other affected areas with soap and water.

Electrical measurements, in this determination, are made at a potential of 500 volts D.C. and, unless the "control" knob is in the "check" position, a severe shock hazard exists in the handling of this apparatus. With the "control" knob in the "charge" and "operate" position, the full voltage of the bridge (500 volts) is applied to the + and low terminals and through the test leads to the electrodes. Do not attempt to handle the electrodes or the test leads unless the "control" knob is in the "check" position.

DETERMINATION

NOTE: If the dielectric constant and power factor (WGK Method 11,608) are to be determined, perform this test last. If the dielectric constant and power factor have been determined, proceed directly to step 6.

1. Fill a clean, assembled test cell with sample until the liquid level is 3/4 inch above the top of the electrodes.

NOTE: Refer to WGK Method 11,608 for cell cleaning procedure.

2. While stirring continuously, heat the cell and sample to 100 (± 0.5)°C. on a hot plate.

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3. Place the cell in the oven and connect the alligator clips so the back lead is connected to the outer electrode and the front lead to the inner electrode.
4. Insert the -1 to 101°C . thermometer in the oven so the bulb is suspended in the sample.
5. Allow fifteen minutes for the cell to reach temperature equilibrium inside the oven.

CAUTION: Be sure megohm "operate" switch is in "check" position.

6. Connect amphenol connector of coaxial cable to oven and insert red plug on other end in + position of "unknown resistor" position on megohm bridge.
7. Throw the three switches at the top of the megohm bridge to "on" position. Allow to warm up for 5 minutes.
8. Check to make sure the temperature is $100 \pm 0.5^{\circ}\text{C}$. Then remove the thermometer from the oven.
9. Bring the galvanometer pointer to zero by turning the "zero adjust" knob.
10. Turn the control knob to "charge" position for 30 seconds (timed by a stopwatch).
11. Turn the control knob to "operate" position and return the galvanometer pointer to zero by adjusting the "multiply by" switch and megohm dial.
12. After exactly 30 seconds by the stopwatch, adjust megohm dial to zero the galvanometer, and switch control switch to check position.
13. Read and record settings of "multiply by" and megohms" dials.

CALCULATION

Resistivity* (in 10^9 ohm-cm) = "megohm" dial reading x "multiply by" reading x capacitance of cell** in $\mu\text{f.}$ x 11.29×0.001 .

*Values of resistivity are qualified by designation of temperature and voltage. These are, for this test, 100°C . and 500 volts D.C.

**Refer to W GK Method 11,608 for determination of cell capacitance.

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Report results to the nearest 50×10^9 ohm-cm.

DISCUSSION

The resistivity of an electrical insulating oil is an index of its insulating properties. High resistivity indicates high resistance to the passage of electrical current and normally, but not necessarily, establishes the absence of conducting contaminants.

REFERENCE

ASTM Standard 1958, part 9, D 1169-58, p. 890.

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