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Number
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Subject
Thermal Stability

Date	Revision
7/95	

Originating Task Group
Deposited Dielectric Task Group (C-13a)

IPC-TM-650
TEST METHODS MANUAL

1.0 Scope This test method establishes a procedure for determining the thermal decomposition temperature of organic films using thermogravimetric analysis (TGA).

2.0 Applicable Documents

ASTM D 618 Standard Practice for Conditioning Plastics and Electrical Insulating Materials for Testing

ASTM D 3850 Standard Test Method for Rapid Thermal Degradation of Solid Electrical Insulating Materials by Thermo-gravimetric Analysis

3.0 Test Specimen The free films are cut to fit into the TGA sample pan giving an initial weight of nominally 2-20 mg.

4.0 Apparatus or Material Thermal gravimetric analysis equipment equipped with air, nitrogen purge, capable of maintaining 5°C heating rate from ambient to 800°C, such as TA Instruments or Perkin Elmer TGA instruments.

5.0 Procedure

5.1 The test specimens should be conditioned at 23 ± 2°C and 50 ± 5% relative humidity for not less than 24 hours prior to testing. Refer to ASTM D 618 and ASTM D 3850.

5.2 Follow the manufacturer's recommendations for equipment startup and calibration.

5.3 Set the dry nitrogen purge rate at 55 cc/min.

5.4 Allow the instrument to purge for 30 min.

5.5 Heat at a rate of 5°C/min from ambient to 150°C.

5.6 Hold the temperature for 15 min to remove any moisture from the specimen.

5.7 Heat at a rate of 5°C/min to 800°C.

5.8 Record the temperature at which 5% additional weight loss occurs based on the weight after the 150°C hold.

5.9 Repeat steps 5.3-5.6 with dry air instead of nitrogen using a new sample.

5.10 Report the thermal decomposition temperature, T_{max}, in degrees Celsius (°C), followed by the evaluation criteria (e.g., 5% wt. loss), and the atmosphere under which the test was conducted (e.g., nitrogen), e.g. 185°C (5% wt. loss, nitrogen).

6.0 Notes

6.1 Calibration of the instrument must be carried out according to the manufacturer's recommendations. The rate of flow of the gas in the cell will have a significant effect on the calibration, therefore the instrument must be calibrated with the same flow rate used during the test. After the instrument has been calibrated, the flow rate should not be changed.

6.2 The surface area of the test specimen will affect the results. If two specimens of the same material are tested, one with a large surface area and one with a small surface area, both of the same mass, the specimen with the smaller surface area will normally lose weight at a slower rate.

6.3 The specimen may initially gain weight due to buoyancy effects.