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IPC-TM-650 TEST METHODS MANUAL

1.0 Scope This test method establishes a procedure for determining the glass transition temperature of organic films using thermal mechanical analysis (TMA).

2.0 Applicable Documents

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

3.0 Test Specimen The test specimen shall consist of a strip 15-20 mm long and 2 mm wide with a minimum thickness of 10 μm .

4.0 Apparatus or Material Perkin-Elmer TMA-7 with a film fixture in extension mode or equivalent equipment capable of handling films less than 25 μm thick.

5.0 Procedure

5.1 The test specimens should be conditioned at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity for not less than 24 hours prior to testing. Refer to ASTM D 618.

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

5.2 Mount the test specimen in the film holder. The sample length (between the grips) should be between 11-13 mm.

5.3 Set the force at 30 mN.

5.4 Perform a prescan by heating at a rate of $20^\circ\text{C}/\text{min}$ under inert atmosphere from ambient to 50°C beyond the apparent completion of the thermal activity to erase previous thermal history.

5.5 Hold the temperature for 10 min.

5.6 Cool to 50°C below the transition temperature observed in the prescan.

5.7 Hold the temperature for 10 min.

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5.8 Reheat the specimen at a rate of $5^\circ\text{C}/\text{min}$ until all desired transitions have been completed.

5.9 The glass transition is determined by a construction procedure on the transition region of the extension versus temperature curve (Figure 1).

5.10 Construct a tangent line to the curve above and below the transition.

5.11 The temperature at which the tangents intersect is the glass transition temperature.

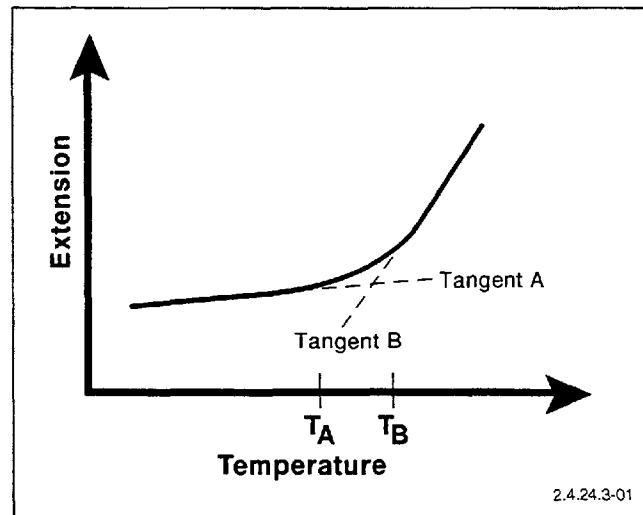


Figure 1

5.12 Report both the glass transition (intersection of tangents), e.g., 200°C (TMA- $5^\circ\text{C}/\text{min}$), and the temperatures at the beginning of tangent A (T_A) and tangent B (T_B) (i.e., the transition range), e.g., transition range: $160\text{-}205^\circ\text{C}$.

6.0 Notes

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