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IPC-TM-650
TEST METHODS MANUAL

Number	
2.4.24.1	
Subject	
Time to Delamination (TMA Method)	
Date	Revision
12/94	
Originating Task Group	
MIL-P-13949 Test Methods Task Group (7-11b)	

1.0 Scope This method describes the method for determining the time to delamination of laminates and printed boards through the use of a thermomechanical analyzer (TMA).

2.0 Applicable Documents

IPC-TM-650 Method 2.4.24, Glass Transition Temperature and Z-Axis Thermal Expansion by TMA.

3.0 Test Specimens

3.1 Size Specimens shall be approximately 6.35 mm x 6.35 mm [0.25 in x 0.25 in] by the thickness of the sample.

3.2 Quantity and Sampling Unless otherwise specified, two specimens shall be tested, to be taken from random locations of the material in question.

4.0 Apparatus or Material

4.1 Drying Chamber Air circulating oven capable of maintaining 105 ±2°C [221 ±3.6°F].

4.2 Cutting Equipment Diamond blade or wheel, sanding equipment, or equivalent, to provide a specimen of the size and edge quality specified.

4.3 Desiccator Dessication chamber capable of maintaining an atmosphere less than 30% RH at 23°C [73.4°F].

4.4 Tester Thermal Mechanical Analyzer (TMA) capable of determination of dimensional change to within ±0.0025 mm [0.0001 in] over the specified temperature range.

5.0 Procedure

5.1 Specimen Preparation

5.1.1 Metallic clad laminates shall be tested as is. Multilayer printed boards may be sampled with internal conductors present. (For determination of a multilayer board's bond integrity, presence of internal conductors is preferred.)

5.1.2 Specimens shall be cut to the specified size using appropriate procedures and equipment to minimize mechanical stress or thermal shock.

5.1.3 The edges shall be smooth and burr-free by means on sanding or equivalent (to allow the specimen to rest completely flat on the mounting stage). Use care to minimize stress or heat on the specimen.

5.1.4 The specimen shall be preconditioned by baking for 2 hours at 105 ±2°C [221 ±3.6°F], then cooled to room temperature in a dessicator.

5.2 Measurement

5.2.1 Remove the specimen from the dessicator and place the specimen on the stage of the TMA taking care that the sample is centered and resting flat on the stage.

5.2.2 Lower the TMA's probe onto the specimen and apply a force of 0.005 Newtons [5g]; then lower the furnace into place around the stage.

5.2.3 Start the temperature ramp (or scan) from an initial temperature no higher than 35°C [95°F].

5.2.4 Maintain the scan at the specified rate. Unless otherwise specified, the scan rate shall be 10°C/minute (see 6.4).

5.2.5 After the scan reaches the specified isothermal temperature, hold at that temperature for 10 minutes or to failure. Unless otherwise specified, the isothermal temperature shall be 260°C [500°F].

If the instrument allows real time display of the data, terminate the experiment after evidence of delamination is displayed.

5.3 Evaluation The time to delamination is determined as the time from the onset of the isotherm to failure. Failure is any event or deviation of the data plot where the thickness is shown to have irreversibly changed. The scan in Figure 1 is typical of an epoxy material at 260°C [500°F] isothermal temperature. On occasion, some materials will delaminate before

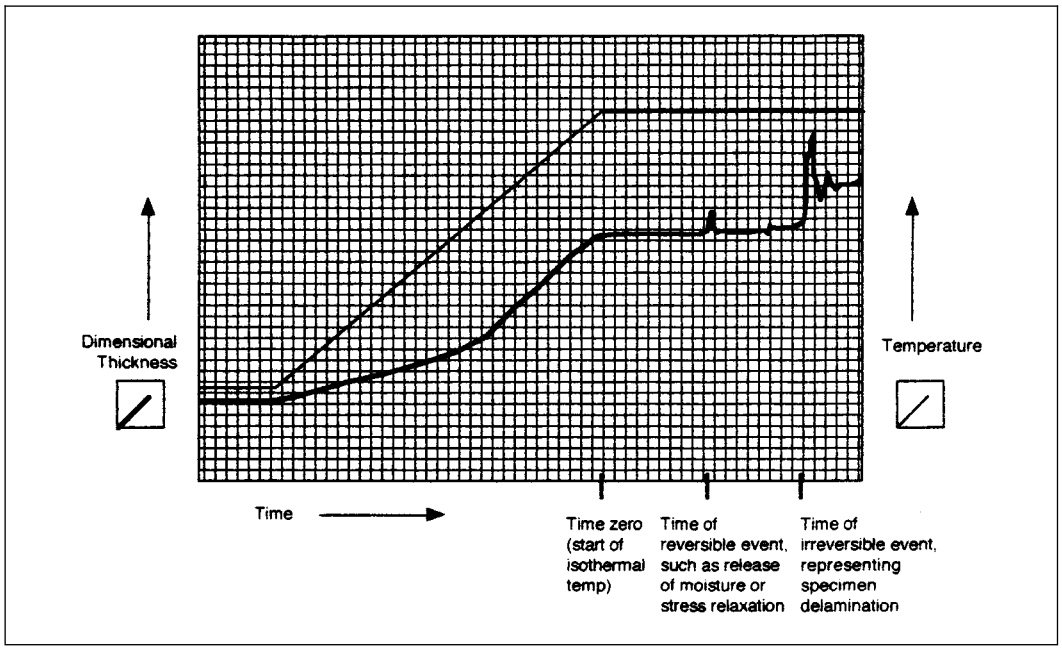

Figure 1

the isotherm is reached. In this case, the temperature at the time of failure shall be recorded.

5.4 Report

5.4.1 Report the Time to Delamination as determined in 5.3. Report the time at which any other plot event has taken place which was not determined to be irreversible.

5.4.2 Report the configuration of the sample (e.g., whether external or internal foil is present).

5.4.3 Report the ramp rate and isothermal temperature if other than that specified.

6.0 Notes

6.1 For epoxy laminates and similar materials, the recommended isothermal temperature is 260°C [500°F]. For polyimides and other high temperature materials, the isothermal temperature may be increased to 288°C [550°F]. For other material types, consult with the material manufacturer.

6.2 Calibration of the instrument should be carried out according to the manufacturer's instructions.

6.3 The T_g of the material may be obtained from this test, which is similar to Method 2.4.24. It should be noted that the T_g so obtained is a ''first pass'' value.

6.4 A faster ramp rate will decrease the time to run, provide some greater distinction between materials, and provide a closer equivalence to the Thermal Stress test, 2.4.13.1.

A rate of 100°C/minute [212° F/minute] is recommended for such determinations.