UL 746B

STANDARD FOR SAFETY

Polymeric Materials – Long Term Property Evaluations

UL Standard for Safety for Polymeric Materials – Long Term Property Evaluations, UL 746B

Fifth Edition, Dated August 15, 2018

SUMMARY OF TOPICS

This revision of ANSI/UL 746B dated May 9, 2024 includes changes to Table 7.1 to reflect the Inclusion of Requirement for Dynamic Mechanical Analysis (DMA) as an Alternate Method to Determine Glass-Transition Temperature of Polyphthalamide (PPA) Generic Material.

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated April 5, 2024.

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Standard for Polymeric Materials – Long Term Property Evaluations

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Second Edition – June, 1979
Third Edition – August, 1996
Fourth Edition – April, 2013

Fifth Edition

August 15, 2018

This ANSI/UL Standard for Safety consists of the Fifth Edition including revisions through May 9, 2024.

The most recent designation of ANSI/UL 746B as an American National Standard (ANSI) occurred on May 9, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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DETERMINATION OF THE TEMPERATURE INDICES OF POLYMERIC MATERIALS

INTRODUCTION

1 Scope

1.1 These requirements cover long-term test procedures to be used for the evaluation of materials used for parts intended for specific applications in end products.

1.2 Together with the Standards mentioned in Supplementary Test Procedures, Section 3, these investigations provide data with respect to the physical, electrical, flammability, thermal, and other properties of the materials under consideration and are intended to provide guidance for the material manufacturer, the molder, the end-product manufacturer, safety engineers, and other interested parties.

2 References

2.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3 Supplementary Test Procedures

3.1 The Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, covers flammability of polymeric materials used for parts in devices and appliances. The Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A, contains short-term test procedures to be used for the evaluation of materials used for parts intended for specific applications in electrical end products. The Standard for Polymeric Materials – Fabricated Parts, UL 746D, contains requirements for traceability and performance of parts molded and fabricated from polymeric materials.

3.2 Programs for the investigation of material part modifications, such as the plating of plastics or the use of flame-retardant paints, are contained in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

3.3 Data concerning the effect of various environments and contaminants upon the properties of materials can also be obtained through standard test procedures. The more commonly used procedures are briefly described in the Standard for Polymeric Materials – Short Term Evaluations, UL 746A.

3.4 Test procedures are provided in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluation, UL 746C, for the evaluation of polymeric materials in specific applications in end products. These test procedures include references to the data obtained from the standard property tests as well as other practical means of evaluation.

3.5 Requirements for materials that have been modified to match the requirements of a specific application, including the use of recycled and regrind materials, the use of additives and colorants, and the blending of two or more materials, are described in the Standard for Polymeric Materials – Fabricated Parts, UL 746D.

3.6 A method and tool for the statistical analysis of long term property evaluation data and including the determination of a temperature index (TI) is described in Sections 22A – 22J based on the Standard for Electrical insulating materials – Thermal endurance properties – Part 3: Instructions for calculating thermal endurance characteristics, IEC 60216-3.

4 Characteristics of Polymeric Materials

4.1 Polymeric materials include thermoplastic, thermosetting, and elastomeric materials. A thermoplastic material can be easily softened and resoftened by repeated heating. A thermosetting material cures by

chemical reaction and, when cured, cannot be resoftened. An elastomeric material is capable of being stretched at room temperature to at least twice its length under low stress and recovers to its original length when released from the stress.

4.2 Characteristics of polymeric materials that necessitate additional consideration include:

a) Mold stresses

b) Insulating quality

c) Resistance to ignition

d) Extinguishing characteristics

e) Production of smoke and gases

f) Mechanical Strength

g) Compatibility with solvents

h) Melting or distortion

i) Cold flow, if under stress

j) Fuel contribution

k) Dimensional stability

5 Use of Polymeric Materials

5.1 The reduction to an acceptable level of the risks of electric shock, fire, and personal injury from electrical equipment depends upon the selection of materials, design, and processing of parts as well as the assembly, mounting, and relative positions of these parts.

5.2 The properties needed by individual parts are defined by the function or functions of the part. An enclosure, for example, must ordinarily be designed to withstand mechanical abuse. Accordingly, a material known to have substantial impact strength would normally be used although a material that has a lower impact strength, but is reinforced, might also be acceptable.

5.3 Electrical equipment of necessity employs many materials that usually have divergent properties. The ability to match the demands of the application with the characteristics of a material as well as the ability to compare the properties of one material with those of another can lead to an acceptable selection of materials.

5.4 The information gained from the data obtained from these tests can be used as an aid in the evaluation of electrical equipment using parts made of polymeric materials. Knowledge of materials can be obtained from an analysis of data from standard tests conducted on small specimens.

DETERMINATION OF THE RELATIVE THERMAL INDICES OF POLYMERIC MATERIALS

6 General

6.1 A relative thermal index of a material (RTI) is an indication of the material's ability to retain a particular property (physical, electrical, etc.) when exposed to elevated temperatures for an extended period of time. It is a measure of the material's thermal endurance. For each material, a number of relative