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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Determining Resistance of Plastics to Bacteria[1]

This standard is issued under the fixed designation G 22; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers two procedures, A and B, for determining the effect of bacteria on the properties of plastics in the form of molded and fabricated articles, tubes, rods, sheets, and film materials. Procedure B provides a more extensive contact between the test bacteria and the specimens than does Procedure A. Changes in optical, mechanical, and electrical properties may be determined by the applicable ASTM methods.

1.2 The values stated in SI units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[2]

G 21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi[3]

3. Summary of Practice

3.1 The procedure described herein consists of the following steps:

3.1.1 Selection of suitable specimens for determination of pertinent properties,

3.1.2 Inoculation of specimens with suitable organisms,

3.1.3 Exposure of inoculated specimens under conditions favorable to growth,

3.1.4 Examination and rating for visual growth, and

3.1.5 Removal, sterilization, and evaluation of specimens.

NOTE 1—Since the procedure involves handling and working with bacteria that may be capable of infecting man, it is essential that personnel trained in microbiology perform the portion of the procedure involving handling of bacterial organisms and inoculated specimens.

4. Significance and Use

4.1 The resin portion of plastic materials is usually resistant to bacteria, in that it does not serve as a carbon source for the growth of bacteria. It is generally the other components, such as plasticizers, lubricants, stabilizers, and colorants that are responsible for bacterial attack on plastic materials. It is important to establish the resistance of plastics to microbial attack when plastics are used under conditions of high temperature and humidity favorable for such attack.

4.2 The effects to be expected are:

4.2.1 Surface attack, discoloration, and loss of transmission (optical).

4.2.2 Removal of susceptible plasticizers, modifiers, and lubricants, resulting in increased modulus (stiffness), changes in weight, dimensions, and other physical properties, and deterioration of electrical properties such as insulation resistance, dielectric constant, power factor, and dielectric strength.

4.3 Often the changes in electrical properties are due principally to surface growth and associated moisture, and to pH changes caused by products of bacterial metabolism. Other effects include preferential growths caused by nonuniform dispersion of plasticizers, lubricants, and other processing additives. Pronounced physical changes may be observed on products in film form or as coatings where the ratio of surface to volume is high, and where nutrient materials such as plasticizers and lubricants continue to diffuse to the surface as they are utilized by the organisms.

4.4 Since attack by organisms involves a large element of change due to local accelerations and inhibitions, the order of reproducibility may be rather low. To assure that estimates of behavior are not too optimistic, the greatest observed degree of deterioration should be reported.

4.5 Conditioning of specimens such as exposure to leaching, weathering, heat treatment, etc., may have significant effects on the resistance of plastics to bacteria. Determination of these effects is not covered in this document.

5. Apparatus

5.1 *Glassware*—Glass vessels are suitable for holding specimens when laid flat. Depending on the size of the specimens, the following are suggested:

5.1.1 For specimens up to 75 mm (3 in.) in diameter, 150-mm (6-in.) covered petri dishes.

5.1.2 For 75-mm (3-in.) and larger specimens, such as tensile and stiffness strips, large petri dishes, trays of borosilicate glass; or baking dishes covered with squares of window glass or other suitable covering.

5.2 *Incubator*—Incubating equipment for all test methods

[1] This practice is under the jurisdiction of ASTM Committee G-3 on Durability of Nonmetallic Materials and is the direct responsibility of Subcommittee G03.04 on Biological Deterioration.

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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 06.01.