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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials[1]

This standard is issued under the fixed designation F 904; 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.

INTRODUCTION

It has been widely discussed in the literature that bond strength of flexible multi-ply materials is impossible to measure with current technology. The above is recognized and accepted, since all known methods of measurement include the force required to bend the separated layers, in addition to that required to separate them. However, useful information can be obtained when one realizes that the bending force is included and that direct comparisons between different materials, or even between the same materials of different thicknesses, cannot be made. Also, conditioning that affects the softness or moduli of the plies will be reflected in the bond strength measurement.

1. Scope

1.1 This test method covers a procedure for comparing the bond strength or ply adhesion of similar laminates made from flexible materials such as cellulose, paper, plastic film, and foil. This includes laminates made by various processes: adhesive laminates, extrusion coatings, extrusion laminates, and coextrusion.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.3 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in 7.1.1.

2. Referenced Documents

2.1 *ASTM Standards:*

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting[2]

D 1898 Practice for Sampling of Plastics[2]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *adhesive failure*—failure at the interface of two adjacent layers.

3.1.2 *cohesive failure*—failure within one of the two adjacent layers comprising the bonded area under test.

3.1.3 *bond strength*—amount of force or energy required to separate plies of material or materials plus the force to bend the plies.

3.1.4 *necking*—localized reduction in cross section which may occur in a material under tensile stress.

3.1.5 *web*—refers to roll stock after it has been unwound from the roll.

4. Summary of Test Method

4.1 Ply separation is initially started mechanically by the application of heat or by using a solvent. The separated plies of the test specimen are placed into the grips of a tensile testing machine. The grips are then separated and the force required to further separate the plies is defined as bond strength. Alternatively, the energy may be used.

NOTE 1—The force to bend the separated plies is included.

5. Significance and Use

5.1 Laminates are made by bonding together two or more layers of material or materials. Their performance is often dependent on the ability of the laminate to function as a single unit. If the plies have not been properly bonded together, the performance may be adversely affected. Laminates may maintain adequate bond strength under standard test conditions, but under conditions of use may exhibit an increase or decrease in bond strength. Applying heat, such as in boilable pouch applications, may adversely affect bond strength, as may cold temperatures, such as those encountered in freezer storage of foods. Fats and oils may also influence bond strength as well as the softness or moduli of the plies. This test method can be

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

[3] *Annual Book of ASTM Standards*, Vol 14.02.