



Designation: D 6105 – 97

Standard Practice for Application of Electrical Discharge Surface Treatment (Activation) of Plastics for Adhesive Bonding¹

This standard is issued under the fixed designation D 6105; 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 various electrical discharge treatments to be used to enhance the ability of polymeric substrates to be adhesively bonded. This practice does not include additional information on the preparation of test specimens or testing conditions as they are covered in the various ASTM test methods or specifications for specific materials.

1.2 The types of discharge phenomena that are used for surface modification of polymers fit into the general category of nonequilibrium or non-thermal discharges in which electron temperature (mean energy) greatly exceeds the gas temperature.

1.3 The technologies included in this practice are:

Technology	Section
Gas plasma at reduced pressure	8
Electrical discharges at atmospheric pressure	9
AC dielectric barrier discharge	9.1
High Frequency Apparatus	9.1.1
Suppressed Spark Apparatus	9.1.2
Arc Plasma Apparatus	9.2
Glow Discharge Apparatus	9.3

NOTE 1—The term “corona treatment” has been applied sometimes in the literature to the different electrical discharge treatment technologies described in Section 9. This practice defines each electrical discharge treatment technology at atmospheric pressure presented in Section 9 and draws the necessary distinctions between them and corona discharge. See Test Method D 1868 for “corona discharge.”

1.4 The values stated in SI units, as detailed in Practice E 380, are to be regarded as the standard.

1.5 *This standard does not purport to address all of the safety concerns, 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 hazard statements appear in Section 6.

2. Referenced Documents

2.1 ASTM Standards:

D 724 Test Method for Surface Wettability of Paper (Angle-of-Contact Method)²

¹ This practice is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of Subcommittee D14.40 on Adhesives for Plastics. Current edition approved March 10, 1997. Published February 1998.

² Annual Book of ASTM Standards, Vol 15.09.

D 907 Terminology of Adhesives³

D 1868 Test Method for Detection and Measurement of Partial Discharge (Corona) Pulses in Evaluation of Insulation Systems⁴

D 2578 Test Method for Wetting Tension of Polyethylene and Polypropylene Films⁵

D 2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding³

D 5946 Test Method for Corona-Treated Polymer Films Using Water Contact Angle Measurements⁶

E 380 Practice for Use of the International System of Units (SI)⁷

3. Terminology

3.1 *Definitions*—Many terms are defined in Terminology D 907.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *AC dielectric barrier discharge, n*—a self-sustaining AC discharge in relatively short gaps with a solid dielectric layer, where the discharge bridges the entire air gap.

3.2.2 *contact angle, n*—the angle in degrees between the substrate surface and the tangent line drawn to the droplet surface from the three-phase point.

3.2.3 *corona, n*—visible partial discharges in gases adjacent to a conductor.

3.2.4 *corona treatment, n*—see Note 1.

3.2.5 *electrical discharge, n*—any of several types of electrical breakdown of gases, primarily air.

3.2.5.1 *Discussion*—The type of discharge depends upon several controllable factors, such as electrode geometry, gas pressure, power supply impedance, etc. When, at atmospheric pressure, the voltage reaches a certain critical value, the current increases very rapidly and a spark results in the establishment of one of the self-sustaining discharges, such as corona, arc, glow and dielectric barrier discharge. In many electrical discharges, ionized regions called plasma exist.

3.2.6 *electrical discharge treatment, n*—activation of a polymer surface using electrical discharges to increase surface

³ Annual Book of ASTM Standards, Vol 15.06.

⁴ Annual Book of ASTM Standards, Vol 10.01.

⁵ Annual Book of ASTM Standards, Vol 08.02.

⁶ Annual Book of ASTM Standards, Vol 08.03.

⁷ Annual Book of ASTM Standards, Vol 14.02.