Designation: D 6068 – 96 (Reapproved 2002)ε1

Standard Test Method for Determining *J-R* Curves of Plastic Materials [1]

This standard is issued under the fixed designation D 6068; 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.

ε[1] NOTE—Editorially corrected figure reference in paragraph 7.3 in November 2002.

1. Scope

1.1 This test method covers the determination of the *J*-integral versus crack growth resistance (*J-R*) curves for polymeric materials.

1.2 This test method is intended to characterize the slow, stable crack growth resistance of bend-type specimens in such a manner that it is geometry insensitive within limits set forth in this test method.

1.3 The recommended specimens are the three-point bend (*SE* (*B*)) and pin-loaded compact tension (*C* (*T*)) specimens. Both specimens have in-plane dimensions of constant proportionality for all sizes. Specimen configurations other than those recommended in this test method may require different procedures and validity requirements.

1.4 This test method describes a multiple specimen method that requires optical measurement of crack extension from fracture surfaces. It is not recommended for use with materials in which the crack front cannot be distinguished from additional deformation processes in advance of the crack tip.

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

1.6 *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.*

NOTE 1—There is no equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 618 Practice for Conditioning Plastics for Testing[2]

D 4066 Classification System for Nylon Injection and Extrusion Materials PA[3]

D 5045 Test Methods for Plane-Strain Fracture Toughness and Strain Energy Release Rate of Plastic Materials[4]

E 399 Test Method for Plane-Strain Fracture Toughness of Metallic Materials[5]

E 616 Terminology Relating to Fracture Testing[5]

E 1152 Test Method for Determining *J-R* Curves[5]

E 1737 Test Method for J-Integral Characterization of Fracture Toughness[5]

F 1473 Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins[6]

3. Terminology

3.1 *Definitions*—Terminology related to fracture testing contained in Terminology E 616 is applicable to this test method.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *J-integral, J (FL* $^{-1}$ *)*—a mathematical expression, a line or surface integral over a path that encloses the crack front from one crack surface to the other, used to characterize the local stress-strain field around the crack front. See Terminology E 616 for additional discussion.

3.2.2 *J-R curve*—a plot of resistance to stable physical crack extension, Δa_p .

3.2.3 *net thickness, B_N (L)*—the distance between the roots of the side grooves in side grooved specimens.

3.2.4 *original crack size, a_0 (L)*—the physical crack size at the start of testing.

3.2.5 *original uncracked ligament, b_0 (L)*—the distance from the original crack front to the back edge of the specimen ($b_0 = W - a'_0$).

3.2.6 *physical crack extension, Δa_p (L)*—an increase in physical crack size ($\Delta a_p = a_p - a_0$).

3.2.7 *physical crack size, a_p (L)*—the distance from a reference line to the observed crack front. The distance may be a calculated average of several measurements along the crack front. The reference line depends on the specimen geometry and is normally defined as in 3.2.10. The reference line is defined prior to specimen deformation.

3.2.8 *specimen span, S(L)*—the distance between specimen supports for the *SE*(*B*) specimen.

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

Current edition approved November 10, 2002. Published January 2003. Originally approved in 1996. Last previous edition approved in 1996 as D 6068 - 96.

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

[3] *Annual Book of ASTM Standards*, Vol 08.02.

[4] *Annual Book of ASTM Standards*, Vol 08.03.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] *Annual Book of ASTM Standards*, Vol 08.04.

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