This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D4018 – 17

Standard Test Methods for Properties of Continuous Filament Carbon and Graphite Fiber Tows[1]

This standard is issued under the fixed designation D4018; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods cover the preparation and tensile testing of resin-impregnated and consolidated test specimens made from continuous filament carbon and graphite yarns, rovings, and tows to determine their tensile properties.

1.2 These test methods also cover the determination of the density and mass per unit length of the yarn, roving, or tow to provide supplementary data for tensile property calculation.

1.3 These test methods include a procedure for sizing removal to provide the preferred desized fiber samples for density measurement. This procedure may also be used to determine the weight percent sizing.

1.4 These test methods include a procedure for determining the weight percent moisture adsorption of carbon or graphite fiber.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D70 Test Method for Density of Semi-Solid Bituminous Materials (Pycnometer Method)

D1193 Specification for Reagent Water

D3800 Test Method for Density of High-Modulus Fibers

D5550 Test Method for Specific Gravity of Soil Solids by Gas Pycnometer

E4 Practices for Force Verification of Testing Machines

E83 Practice for Verification and Classification of Extensometer Systems

2.2 *Other Document:*

CRC Handbook of Chemistry and Physics[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *sizing, n*—a generic term for compounds which, when applied to yarn or fabric, form a more or less continuous solid film around the yarn and individual fibers.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *desized fiber, n*—fiber which has had a sizing removed from it.

3.2.2 *fiber, n*—continuous filament carbon or graphite yarn, roving, or tow.

3.2.3 *sized fiber, n*—a fiber with a sizing applied to it.

3.2.4 *unsized fiber, n*—fiber which has never had a sizing applied to it.

3.3 *Symbols:*

3.3.1 A—Unit conversion factor for tensile strength

3.3.2 B—Unit conversion factor for tensile modulus

3.3.3 E—fiber chord modulus

3.3.4 ε_l—Lower strain limit

3.3.5 ε_u—Upper strain limit

3.3.6 k_c—correction factor for density of size

3.3.7 L—specimen length

3.3.8 MUL—the mass per unit length of the sized fiber

3.3.9 MUL_f—the mass per unit length of the impregnated and consolidated fiber

3.3.10 P—maximum load

3.3.11 P_l—tensile load at lower strain limit

[1] These test methods are under the jurisdiction of ASTM Committee D30 on Composite Materials and are the direct responsibility of Subcommittee D30.03 on Constituent/Precursor Properties.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] CRC Press Inc., Boca Raton, Ann Arbor, London, Tokyo, 73rd Edition, 1992–1993.

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