



Designation: D8377 – 21a

Standard Guide for High Temperature Strength Measurements of Graphite Impregnated with Molten Salt¹

This standard is issued under the fixed designation D8377; 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 guide covers the best practice for strength measurements at elevated temperature of graphite impregnated with molten salt.

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

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

C651 Test Method for Flexural Strength of Manufactured Carbon and Graphite Articles Using Four-Point Loading at Room Temperature

C695 Test Method for Compressive Strength of Carbon and Graphite

C749 Test Method for Tensile Stress-Strain of Carbon and Graphite

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D8091 Guide for Impregnation of Graphite with Molten Salt

D8289 Test Method for Tensile Strength Estimate by Disc

¹ This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.F0 on Manufactured Carbon and Graphite Products.

Current edition approved July 1, 2021. Published July 2021. Originally approved in 2021. Last previous edition approved in 2021 as D8377 – 21. DOI: 10.1520/D8377-21A.

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.

[Compression of Manufactured Graphite](#)

[E4 Practices for Force Verification of Testing Machines](#)

3. Terminology

3.1 For definitions of terms used in this guide, refer to Terminology [D4175](#).

4. Summary of Guide

4.1 There is currently a set of ASTM standards as stated in [2.1](#) that can be applied to graphite for different strength measurements (Test Methods [C651](#), [C695](#), [C749](#), [D8289](#)). Each of these standards has been developed specifically to provide a method of measurement for graphite as a single material. However, in some applications such as in molten salt reactors, graphite components are submerged in a molten salt. In order to assess the effect of molten salt on graphite components, a method may be necessary for the measurement of strength for graphite specimens both impregnated with molten salt and at elevated temperatures (see Section [6](#)). The objective of this guide is to provide advice on the application of selected standards for graphite specimens impregnated with molten salt and tested at elevated temperatures. This includes transportation of graphite specimens impregnated with molten salt, temperature measurement, equipment for measuring compressive, tensile, or flexural strength at elevated temperature, and safe handling of the molten salt.

5. Significance and Use

5.1 The Molten Salt Reactor is a nuclear reactor which uses graphite as reflector and structural material, and molten salt as coolant. The graphite components will be submerged in the molten salt during the lifetime of the reactor. The porous structure of graphite may lead to molten salt permeation, which can affect the thermal and mechanical properties of graphite. Consequently, it may be necessary to measure the various strengths of the manufactured graphite materials after impregnation with molten salt and before exposure to the reactor environment in a range of test configurations in order for designers or operators to assess their performance.

NOTE 1—Depending upon the salt selected for the reactor, there may be some chemical reaction between the salt and the graphite that could affect properties. The user should establish, prior to following this guide, that

*A Summary of Changes section appears at the end of this standard