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# Standard Guide for Testing the Thermal Properties of Advanced Ceramics[1]

This standard is issued under the fixed designation C 1470; 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 thermal property testing of advanced ceramics, to include monolithic ceramics, particulate/whisker-reinforced ceramics, and continuous fiber-reinforced ceramic composites. It is intended to provide guidance and information to users on the special considerations involved in determining the thermal properties of these ceramic materials.

1.2 This guide is based on the use of current ASTM standards for thermal properties where appropriate and on the development of new test standards where necessary.

1.3 It is not the intent of this guide to rigidly specify particular thermal test methods for advanced ceramics. Guidance is provided on how to utilize the most commonly available ASTM thermal test methods, considering their capabilities and limitations.

1.4 *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]

2.1.1 *Specific Heat:*

C 351-92b Test Method for Mean Specific Heat of Thermal Insulation

D 2766-95 Test Method for Specific Heat of Liquids and Solids

E 1269-95 Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry

2.1.2 *Thermal Conductivity:*

C 177 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

C 182 Test Method for Thermal Conductivity of Insulating Firebrick

C 201 Test Method for Thermal Conductivity of Refractories

C 202 Test Method for Thermal Conductivity of Refractory Brick

C 408 Test Method for Thermal Conductivity of Whiteware Ceramics

C 518 Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C 767 Test Method for Thermal Conductivity of Carbon Refractories

C 1044 Practice for Using the Guarded-Hot-Plate Apparatus or Thin-Heater Apparatus in the Single-Side Mode

C 1045 Practice for Calculating Thermal Transmission Properties from Steady-State Heat Flux Measurements

C 1113 Test Method for Thermal Conductivity of Refractories by Hot Wire (Platinum Resistance Thermometer Technique)

C 1114 Test Method for Steady-State Thermal Transmission Properties by Means of the Thin-Heater Apparatus

C 1132 Practice for Calibration Practice for Heat Flow Meter Apparatus[2]

E 1225 Test Method for Thermal Conductivity of Solids by Means of the Guarded-Comparative-Longitudinal Heat Flow Technique

E 1530 Test Method for Evaluating the Resistance to Thermal Transmission of Thin Specimens of Materials by the Guarded Heat Flow Meter Technique

2.1.3 *Thermal Expansion:*

C 372 Test Method for Linear Thermal Expansion of Porcelain Enamel and Glaze Frits and Fired Ceramic Whiteware Products by the Dilatometer Method

C 1300 Test Method for Linear Thermal Expansion of Glaze Frits and Ceramic Whiteware Materials by the Interferometric Method

E 228 Test Method for Linear Thermal Expansion of Solid Materials With a Vitreous Silica Dilatometer

E 289 Test Method for Linear Thermal Expansion of Rigid Solids with Interferometry

E 831 Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis

2.1.4 *Thermal Diffusivity:*

C 714 Test Method for Thermal Diffusivity of Carbon and Graphite by a Thermal Pulse Method

[1] This guide is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.03 on Physical Properties and Performance.

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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.

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