



Standard Test Methods for Determining Chemical Durability of Nuclear, Hazardous, and Mixed Waste Glasses and Multiphase Glass Ceramics: The Product Consistency Test (PCT)¹

This standard is issued under the fixed designation C1285; 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 These product consistency test methods A and B provide a measure of the chemical durability of homogeneous glasses, phase separated glasses, devitrified glasses, glass ceramics, multiphase glass ceramic waste forms, or combinations thereof, hereafter collectively referred to as “glass waste forms” by measuring the concentrations of the chemical species released to a test solution under carefully controlled conditions.

1.1.1 Test Method A is a seven-day chemical durability test performed at $90 \pm 2^\circ\text{C}$ in a leachant of ASTM-Type I water. The test method is static and conducted in stainless steel vessels. The stainless steel vessels require a gasket to remain leak-tight.² The stainless steel vessels are considered to be “closed system” tests. Test Method A can specifically be used to evaluate whether the chemical durability and elemental release characteristics of nuclear, hazardous, and mixed glass waste forms have been consistently controlled during production. This test method is applicable to radioactive and simulated glass waste forms as defined above.

1.1.2 Test Method B is a durability test that allows testing at various test durations, test temperatures, particle size and masses of glass sample, leachant volumes, and leachant compositions. This test method is static and can be conducted in stainless steel or PFA TFE-fluorocarbon vessels. The stainless steel vessels are considered to be “closed system” while the PFA TFE-fluorocarbon vessels are considered to be “open system” tests. Test Method B can specifically be used to evaluate the relative chemical durability characteristics of homogeneous glasses, phase separated glasses, devitrified glasses, glass ceramics, or multiphase glass ceramic waste

forms, or combinations thereof. This test method is applicable to radioactive (nuclear) and mixed, hazardous, and simulated glass waste forms as defined above. Test Method B cannot be used as a consistency test for production of high level radioactive glass waste forms.

1.2 These test methods must be performed in accordance with all quality assurance requirements for acceptance of the data.

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

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:*³

C92 Test Methods for Sieve Analysis and Water Content of Refractory Materials
C162 Terminology of Glass and Glass Products
C169 Test Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass
C225 Test Methods for Resistance of Glass Containers to Chemical Attack
C371 Test Method for Wire-Cloth Sieve Analysis of Non-plastic Ceramic Powders
C429 Test Method for Sieve Analysis of Raw Materials for Glass Manufacture
C693 Test Method for Density of Glass by Buoyancy
C859 Terminology Relating to Nuclear Materials
C1109 Practice for Analysis of Aqueous Leachates from Nuclear Waste Materials Using Inductively Coupled Plasma-Atomic Emission Spectroscopy

¹ These test methods are under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and are the direct responsibility of Subcommittee C26.13 on Spent Fuel and High Level Waste.

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² TFE-fluorocarbon gaskets, available commercially, are acceptable and chemically inert up to radiation doses of 1×10^5 R of beta or gamma radiation which have been shown not to damage TFE-fluorocarbon. If higher radiation doses are anticipated, special gaskets fabricated from metals such as copper, gold, lead, or indium are recommended.

³ 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.