



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

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1. Scope

1.1 These product consistency test methods A and B evaluate the chemical durability of homogeneous glasses, phase separated glasses, devitrified glasses, glass ceramics, and/or multiphase glass ceramic waste forms hereafter collectively referred to as “glass waste forms” by measuring the concentrations of the chemical species released to a test solution.

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. 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, mesh size, mass of sample, leachant volume, and leachant compositions. This test method is static and can be conducted in stainless steel or PFA TFE-fluorocarbon vessels, or both. Test Method B can specifically be used to evaluate the relative chemical durability characteristics of homogeneous glasses, phase separated glasses, devitrified glasses, glass ceramics, and/or multiphase glass ceramic waste forms. This test method is applicable to radioactive (nuclear) and mixed, hazardous, and simulated 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 *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 applica-*

bility of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

- C 92 Test Methods for Sieve Analysis and Water Content of Refractory Materials²
- C 162 Terminology of Glass and Glass Products³
- C 169 Test Methods for Chemical Analysis of Soda-Lime and Borosilicate Glass³
- C 225 Test Methods for Resistance of Glass Containers to Chemical Attack³
- C 371 Test Method for Wire-Cloth Sieve Analysis of Non-plastic Ceramic Powders³
- C 429 Test Method for Sieve Analysis of Raw Materials for Glass Manufacture³
- C 693 Test Method for Density of Glass by Buoyancy
- C 1109 Test Method for Analysis of Aqueous Leachates from Nuclear Waste Materials Using Inductively Coupled Plasma-Atomic Emission Spectrometry⁴
- C 1174 Practice for Prediction of the Long-Term Behavior of Materials, Including Waste Forms, Used in Engineered Barrier Systems (EBS) for Geologic Disposal of High-Level Radioactive Waste⁴
- C 1463 Practices for Dissolving Glass Containing Radioactive and Mixed Waste for Chemical and Radiochemical Analysis⁴
- D 1125 Test Methods for Electrical Conductivity and Resistivity of Water⁵
- D 1129 Terminology Relating to Water⁵
- D 1193 Specification for Reagent Water⁵
- D 1293 Test Methods for pH of Water⁵
- D 4327 Test Method for Anions in Water by Chemically Suppressed Ion Chromatography⁵
- E 7 Terminology Relating to Metallography⁶
- E 177 Practice for Use of the Terms Precision and Bias in

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 *Annual Book of ASTM Standards*, Vol 15.01.

³ *Annual Book of ASTM Standards*, Vol 15.02.

⁴ *Annual Book of ASTM Standards*, Vol 12.01.

⁵ *Annual Book of ASTM Standards*, Vol 11.01.

⁶ *Annual Book of ASTM Standards*, Vol 03.01.