



Designation: C1174 – 17

Standard Practice for Evaluation of the Long-Term Behavior of Materials Used in Engineered Barrier Systems (EBS) for Geological Disposal of High-Level Radioactive Waste¹

This standard is issued under the fixed designation C1174; 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 practice addresses how various test methods and data analyses can be used to develop models for the evaluation of the long-term alteration behavior of materials used in engineered barrier system (EBS) for the disposal of spent nuclear fuel (SNF) and other high-level nuclear waste in a geologic repository. The alteration behavior of waste forms and EBS materials is important because it affects the retention of radionuclides within the disposal system either directly, as in the case of waste forms in which the radionuclides are initially immobilized, or indirectly, as in the case of EBS containment materials that restrict the ingress of groundwater or the egress of radionuclides that are released as the waste forms degrade.

1.2 The purpose of this practice is to provide a scientifically-based strategy for developing models that can be used to estimate material alteration behavior after a repository is permanently closed (that is, the post-closure period) because the timescales involved with geological disposal preclude direct validation of predictions.

1.3 This practice also addresses uncertainties in materials behavior models and the impact on the confidence in the EBS design criteria, the scientific bases of alteration models, and repository performance assessments using those models. This includes the identification and use of conservative assumptions to address uncertainty in the long-term performance of materials.

1.3.1 Steps involved in evaluating the performance of waste forms and EBS materials include problem definition, laboratory and field testing, modeling of individual and coupled processes, and model confirmation.

1.3.2 The estimates of waste form and EBS material performance are based on models derived from theoretical

considerations, expert judgments, and interpretations of data obtained from tests and analyses of appropriate analogs.

1.3.3 For the purpose of this practice, tests are categorized according to the information they provide and how it is used for model development, support, and use. These tests may include but are not limited to: accelerated tests, attribute tests, characterization tests, confirmation tests, and service condition tests.

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 requirements prior to use.*

1.5 *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

C859 Terminology Relating to Nuclear Materials

C1285 Test Methods for Determining Chemical Durability of Nuclear, Hazardous, and Mixed Waste Glasses and Multiphase Glass Ceramics: The Product Consistency Test (PCT)

C1682 Guide for Characterization of Spent Nuclear Fuel in Support of Interim Storage, Transportation and Geologic Repository Disposal

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E178 Practice for Dealing With Outlying Observations

E583 Practice for Systematizing the Development of

¹ This practice is under the jurisdiction of ASTM Committee C26 on Nuclear Fuel Cycle and is the direct responsibility of Subcommittee C26.13 on Spent Fuel and High Level Waste.

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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.