



Standard Test Method for Accelerated Leach Test for Diffusive Releases from Solidified Waste and a Computer Program to Model Diffusive, Fractional Leaching from Cylindrical Waste Forms¹

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1. Scope

1.1 This test method provides a method for accelerating the leach rate of solidified waste and determining if the release is diffusion-controlled. This test method is applicable to any material that does not degrade, deform, or change leaching mechanism during the test.

1.1.1 If diffusion is the dominant leaching mechanism, then results of this test can be used to model long-term releases from waste forms. Diffusion can be confirmed as the leaching mechanism through the use of a computerized mathematical model for diffusion from the finite cylinder (Note 1).

1.1.2 The leaching mechanism should be verified as diffusion-controlled by a means other than analysis of the leach test data. For this purpose, analysis of post-leaching concentration profiles within the solid waste form is recommended.

NOTE 1—The computer program and the models are briefly described in Annex A1 and in the Accelerated Leach Test Method and User's Guide for the "ALT" Computer Program (1).

1.2 *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:

E 632 Standard Practice for Developing Accelerated Tests to Aid Prediction of the Service Life of Building Components and Materials²

D 1193 Standard Specification for Reagent Water³

2.2 ANSI/ANS Standard:

ANSI 16.1 Measurement of the Leachability of Solidified

Low-Level Radioactive Wastes by a Short-Term Test Procedure⁴

3. Terminology

3.1 *cumulative fraction leached*—the sum of the fractions of a species leached during all sampling intervals calculated as $CFL = \sum a_n / A_O$ and assuming no radioactive decay, where a_n is the quantity of a species in the leachate during any interval and A_O is the quantity of that species originally present in the sample.

3.2 *diffusion coefficient (diffusivity)*—based on Fick's Laws for diffusion, the diffusion coefficient is the ratio of the rate of transfer of a diffusing substance through the unit area of a section to the concentration gradient measured normal to the section.

3.3 *effective diffusion coefficient (effective diffusivity)*—the diffusion coefficient that results from diffusion as it is modified by other processes (for example, adsorption) or physical constraints (for example, tortuosity and constrictivity).

3.4 *finite cylinder (finite medium)*—a bounded body for which Fick's diffusion equation can be solved.

3.5 *incremental fraction leached*—the fraction leached of a species of interest during a single sampling interval calculated as $IFL = a_n / A_O$ and assuming no radioactive decay.

3.6 *leachant*—the liquid that contacts the specimen during a leach test or contacts a waste form in the disposal environment.

3.7 *leachate*—the leachant after contacting the specimen or the waste form.

3.8 *leaching*—the process (or processes) by which mass transport from a solid to a liquid takes place.

3.9 *leaching interval*—the length of time during which a given volume of leachant is in contact with a specimen.

3.10 *leaching mechanism*—the process that controls the rate of mass transport out of a specimen during leaching.

3.11 *reference leach test*—a leach test conducted under defined conditions, the results of which are used as a standard against which the results of other leach tests (for example, accelerated) are compared. In this test method a reference leach

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² Annual Book of ASTM Standards, Vol 14.02.

³ Annual Book of ASTM Standards, Vol 11.01.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.