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American National Standard Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure

Secretariat
American Nuclear Society

Prepared by the
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Standards Committee
Working Group ANS-16.1

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American National Standard

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Foreword

(This Foreword is not a part of American National Standard for the Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-Term Test Procedure, ANSI/ANS-16.1-1986.)

This standard provides a limited leach test procedure to measure the release of radionuclides from waste forms by leaching at ambient temperatures. It is intended for solidified low-level radioactive waste. The procedure permits accumulation of sufficient data for the determination of a material parameter in short times (days and months) using leach test specimens with simple shapes and finite dimensions. This parameter is used to characterize the leaching of a specific radioactive species from the waste form and is called the "Leachability Index" (L). Discussions of the interpretation and limitations of this Index are included.

This standard was drafted by Working Group ANS-16.1 of the American Nuclear Society Standards Committee which had the following membership at the time of its approval of this standard:

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1. Introduction

The characteristics of radioactive wastes (radwastes) from the nuclear industry are dependent on many diverse factors, most of which do not lend themselves to simple definition and standardization. However, in this standard, low-level wastes are considered to be those radioactive wastes which are defined as low-level in Title 10, Code of Federal Regulations, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste" [1][1]. In general, Section 61.2 of Part 61 defines low-level wastes as those containing source, special nuclear, or by-product material that are not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or uranium or thorium tailings and waste. Low-level radioactive waste accrues in the form of combustible, noncombustible, compactible, and noncompactible solids (cloth, metal, paper, wood, etc.), liquids (evaporator bottoms, decontamination solutions, etc.), slurries (filter sludges, ion-exchange resins, etc.) and powders (incinerator ash, salts, etc.). The present effort addresses itself to but one facet of the overall issue: low level, non-selfheating, radioactive fluids (liquids, slurries, and free flowing powders).

An accepted method for managing these liquids, slurries, and powders is solidification, packaging, and subsequent shipment for disposal by shallow-land burial. Solidification can restrict dispersal during handling and transportation and can provide a non-changing volume during the residence time of the waste in the burial trench.

1.1 Need. At present, generators of low-level radioactive wastes (e.g., nuclear power plants, laboratories, and hospitals) need a common basis for evaluating the alternatives for packaging, handling, storing, and shipping their radioactive wastes. Vendors of solidification systems need a common basis for evaluating the leachability of the waste forms made by their solidification processes. Burial ground operators need leaching information to improve the efficiency of their handling, disposal, and site maintenance operations.

1.2 Purpose. The quantification of the leaching characteristics of solidified wastes requires a standardized, practical method to measure the ability of the solids to impede the release of radioisotopes when water comes in contact with them. The purpose of this standard is to establish such a test, define a material parameter, and provide a mathematical procedure for calculating a "Leachability Index" value for the test data collected over the time period of the test.

This standard is intended to serve as a basis for indexing radionuclide release from solidified low-level radioactive waste forms in a short-term (3-month) test under controlled conditions in a well defined leachant. It is not intended to serve as a definition of the long-term (several hundred to thousands of years) leaching behavior of these forms at conditions representing actual disposal conditions.

Under such leaching conditions, mechanisms other than diffusion (e.g., chemical reaction, surface layers and films, cracking, etc.) are important considerations. Also, the interplay of retardation mechanisms (filtration, ion exchange, coprecipitation, etc.) and enhancement mechanisms (chelation, desorption, dissolution, etc.) for radionuclide migration are important considerations.

1.3 Scope. This standard provides a uniform procedure to measure and index the release of radionuclides from waste forms as a result of leaching in demineralized water for three months. The results cannot be interpreted to apply to any specific environmental situation except through correlative studies of actual disposal site conditions.

[1]Numbers in brackets refer to corresponding numbers in Section 4, References.