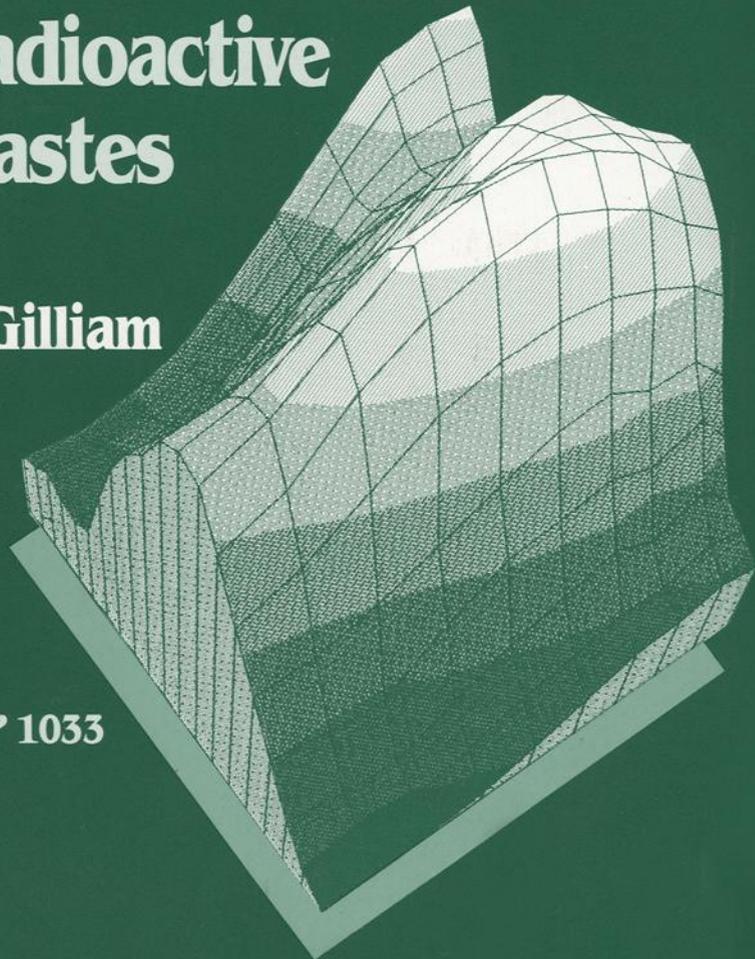


# Environmental Aspects of Stabilization and Solidification of Hazardous and Radioactive Wastes

**Côté/Gilliam**

*editors*

**ASTM** STP 1033



**STP 1033**

***Environmental Aspects of  
Stabilization and Solidification  
of Hazardous and Radioactive  
Wastes***

*Pierre Côté and Michael Gilliam, editors*



ASTM  
1916 Race Street  
Philadelphia, PA 19103

## Library of Congress Cataloging-in-Publication Data

Environmental aspects of stabilization and solidification of hazardous and radioactive wastes/Pierre Côté and Michael Gilliam, editors.  
(STP; 1033)

"ASTM publication code number (PCN)"—T.p. verso.

Papers presented at the Fourth International Hazardous Waste Symposium on Environmental Aspects of Stabilization/Solidification of Hazardous and Radioactive Wastes held 3-6 May, 1987 in Atlanta, Georgia.

Includes bibliographical references.

ISBN (invalid) 0-8031-1261-0

1. Hazardous wastes—Environmental aspects—Congresses.

2. Radioactive wastes—Environmental aspects—Congresses. 3. Sewage sludge digestion—Environmental aspects—Congresses. I. Côté,

Pierre. II. Gilliam, T. M. III. International Hazardous Waste Symposium on Environmental Aspects of Stabilization/Solidification of Hazardous and Radioactive Wastes (4th: 1987: Atlanta, Ga.)

IV. Series: ASTM special technical publication; 1033.

TD1060.E58 1989

628.4'2--dc20

89-17761  
CIP

Copyright © by AMERICAN SOCIETY FOR TESTING AND MATERIALS 1989

### NOTE

The Society is not responsible, as a body,  
for the statements and opinions  
advanced in this publication

### Peer Review Policy

Each paper published in this volume was evaluated by three peer reviewers. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM.

## Foreword

The papers in this publication, *Environmental Aspects of Stabilization and Solidification of Hazardous and Radioactive Wastes*, were presented at the Fourth International Hazardous Waste Symposium on Environmental Aspects of Stabilization/Solidification of Hazardous and Radioactive Wastes held 3–6 May 1987 in Atlanta, Georgia. The symposium was organized by ASTM Committee D-34 on Waste Disposal, Environmental Canada, Oak Ridge National Laboratory, Alberta Environmental Centre, and U.S. Department of Energy. The cooperating organizations included U.S. Environmental Protection Agency and Imperial College of Science and Technology. Michael Gilliam, Oak Ridge National Laboratory, and Pierre Côté, Environmental Canada, presided as symposium chairmen and are editors of this publication.

# Contents

<b>Overview</b>	000
-----------------	-----

## PROCESSES

<b>The Soliroc Process in North America: A Stabilization/Solidification Technology for the Treatment of Metal-Bearing Wastes with Reference to Extraction Procedure Toxicity Testing—DOUG EZELL AND PIERO SUPPA</b>	7
<b>Systematic Approach for the Design of Pumpable, Cement-Based Grouts for Immobilization of Hazardous Wastes—TERRY L. SAMS AND T. MICHAEL GILLIAM</b>	15
<b>The Use of Bitumen in the Stabilization of Mixed Wastes—DEBORAH P. SWINDLEHURST, R. D. DOYLE, AND A. J. MATTUS</b>	21
<b>Leaching and Comprehensive Regulatory Performance Testing of an Extruded Bitumen Containing a Surrogate, Sodium Nitrate-Based, Low-Level Waste—A. J. MATTUS, M. M. KACZMARSKY, AND C. K. COFER</b>	28
<b>Surface Encapsulation Process for Stabilizing Intractable Contaminants—SAMUEL L. UNGER, RODNEY W. TELLES, AND HYMAN R. LUBOWITZ</b>	40
<b>A Process for Solidifying Sodium Nitrate Waste in Polyethylene—J. H. HEISER, III, EENA-MAI FRANZ, AND PETER COLOMBO</b>	53
<b>Development of a Composite Polyethylene-Fiberglass-Reinforced-Plastic High-Integrity Container for Disposal of Low-Level Radioactive Waste—HOMER LOWENBERG AND MARK D. SHAW</b>	63

## REGULATORY ASPECTS AND TESTING METHODS

<b>Nuclear Regulatory Commission Regulations and Experience with Solidification/Stabilization Technology—THOMAS JUNGLING AND JOHN GREEVES</b>	77
<b>Characterization and Control of Solidified Radioactive Wastes According to the Italian Rules: Organization of a Characterization Facility and First Results—GIUSEPPE A. RICCI AND A. DONATO</b>	83

<b>A Quality-Assurance Procedure for Use at Treatment Plants to Predict the Long-Term Suitability of Cement-Based Solidified Hazardous Wastes Desposited in Landfill Sites</b> —PHILIP E. RUSHBROOK, GRANT BALDWIN, AND CHRISTOPHER B. DENT	93
<b>A Critical Review of Evaluation Procedures for Stabilization/Solidification Processes</b> —CHI S. POON	114
<b>Leaching Characteristics of Construction Materials and Stabilization Products Containing Waste Materials</b> —HANS A. VAN DER SLOOT, GERARD J. DE GROOT, AND JAN WIJKSTRA	125
<b>Extraction Procedure Toxicity and Toxicity Characteristic Leaching Procedure Extractions of Industrial and Solidified Hazardous Waste</b> —WILLIAM E. SHIVELY AND MIKE A. CRAWFORD	150
<b>Leaching Characteristics of Selected Elements from Coal Fly Ash as a Function of the Acidity of the Contact Solution and the Liquid/Solid Ratio</b> —GERARD J. DE GROOT, JAN WIJKSTRA, DIRK HOEDE, AND HANS A. VAN DER SLOOT	170
<b>Evaluating the Freeze-Thaw Durability of Portland Cement-Stabilized-Solidified Heavy Metal Waste Using Acoustic Measurements</b> —TAHAR EL-KORCHI, DAVID GRESS, KENNETH BALDWIN, AND PAUL BISHOP	184
<b>Development of a Liquid Release Tester</b> —CARL P. SWANSTROM	192
<b>Comparative Studies of Metal Containment in Solidified Matrices by Scanning and Transmission Electron Microscopy</b> —MARIA NEUWIRTH, RANDY MIKULA, AND PETER HANNAK	201
<b>A Physical Testing Program for Stabilized Metal Hydroxide Sludges</b> —BARBARA L. FORSLUND, LIANE J. SHEKTER SMITH, AND WAYNE R. BERGSTROM	214

#### LABORATORY EVALUATION

<b>Experimental Evaluation of Limiting Factors for Leaching Mechanism in Solidified Hazardous Wastes</b> —F. MEDICI, C. MERLI, G. SCOCCIA, AND R. VOLPE	229
<b>Column Leach Testing of Phenol and Trichloroethylene Stabilized/Solidified with Portland Cement</b> —BETTE KOLVITES AND PAUL BISHOP	238
<b>A Study of Tritium Release from Encapsulated Titanium Tritide Accelerator Targets</b> —ROBERT R. LANDOLT AND LINDA R. BAUER	251
<b>Metal Immobilization by Solidification of Hydroxide and Xanthate Sludges</b> —RAY MARK BRICKA AND DONALD O. HILL	257

<b>The Use of Activated Charcoal and Tetra-Alkylammonium-Substituted Clays in Cement-Based Stabilization/Solidification of Phenols and Chlorinated Phenols</b> —TIPPU S. SHERIFF, CHRISTOPHER J. SOLLARS, DIANA MONTGOMERY, AND ROGER PERRY	273
<b>Solubility and Stability of Inorganic Iodides: Candidate Waste Forms for Iodine-129</b> —PETER TAYLOR, VINCENT J. LOPATA, DONALD D. WOOD, AND HAROLD YACYSHYN	287
<b>Leaching-Induced Concentration Profiles in the Solid Phase of Cement</b> —MARK FUHRMANN AND PETER COLOMBO	302

#### LARGE-SCALE EVALUATION OR DEMONSTRATION

<b>Strategy for Management of Mixed Wastes at the West Valley Demonstration Project</b> —JOHN P. ENGLERT, CARLYLE J. ROBERTS, AND EUGENE E. SMELTZER	317
<b>Leaching Low-Level Radioactive Waste in Simulated Disposal Conditions</b> —LEO P. BUCKLEY, NANCY B. TOSELLO, AND BRENT L. WOODS	330
<b>Stabilization of Mixed Waste at the Idaho National Engineering Laboratory</b> —ANN M. BOEHMER, ROBERT L. GILLINS, AND MILO M. LARSEN	343
<b>Influence of Hydrologic Factors on Leaching of Solidified Low-Level Waste Forms at an Arid-Site Field-Scale Lysimeter Facility</b> —TIM L. JONES AND RICHARD L. SKAGGS	358
<b>Experience Acquired in the Field of Long-Term Leaching Tests on Blocks of Radioactive Waste</b> —J. C. NOMINE AND A. BILLON	381
<b>Large-Scale Demonstration of Low-Level Waste Solidification in Saltstone</b> —P. F. MCINTYRE, S. B. OBLATH, AND E. L. WILHITE	392
<b>Field Testing of Waste Forms Using Lysimeters</b> —ROBERT D. ROGERS, JOHN W. MCDONNELL, EDWARD C. DAVIS, AND MELVIN W. FINDLY	404
<b><i>In Situ</i> Grouting of Shallow Landfill Radioactive Waste Trenches</b> —ROGER D. SPENCE AND TSUNEO TAMURA	418

#### INDEXES

<b>Author Index</b>	431
<b>Subject Index</b>	433

ISBN 0-8031-1261-0