Waste Management Research Abstracts

Information on Radioactive Waste Management Research in Progress or Planned

Volume 25

IAEA/WMRA/25

International Atomic Energy Agency

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FOREWORD

The research abstracts contained in Volume 25 of the Waste Management Research Abstracts (WMRA 25) were collected between January 1 and June 30, 2000. The abstracts reflect research in progress, or planned, in the field of radioactive waste management. For abstracts of completed research and other published information, the reader is advised to consult one of the many available commercial or non-commercial bibliographic information services, such as the IAEA's International Nuclear Information System (INIS). Please refer to the following URL for INIS:

http://www.iaea.org/programmes/inis/index.html

Though the information contained in this publication covers a wide range of programmes in many countries, the WMRA should not be interpreted as providing a complete survey of ongoing research in IAEA Member States. Enquiries for further information concerning a particular research abstract should be addressed to the author(s) at his/her institute.

The total number of abstracts published in WMRA 25 is 297. This is comparable to the number of abstracts for each of volumes 23 and 24, which were combined into WMRA 23-24 for a total of 678 abstracts (339 per volume). The slight reduction in the number of abstracts per volume might be attributable to several factors:

- WMRA 22 was published in 1994 and WMRA 23-24 was published in 1999 - the long delay in publishing abstracts for research in progress may have raised concerns about the timeliness of the WMRA information.
- During the compilation of abstracts for WMRA 23-24, the Agency was in the midst of developing and implementing an Internet-based mechanism for abstract submissions and reporting. In addition, it implemented an "in-house" administrative system for abstract review, authorization and publication. WMRA 25 was the first WMRA volume that relied on the Internet-based submission process and the administrative system. As with any new computer application, technical problems were experienced, which may have affected the number of submissions.
- The time frame for collecting abstracts for WMRA 25 was much shorter than for previous volumes, which could also have accounted for the slight reduction in the number of abstracts received for WMRA 25.

While the number of submissions to WMRA 25 is lower than for past volumes, there has been a dramatic change in the accessibility and availability of the abstracts that were submitted. As indicated above, nearly six years transpired between the publication of WMRA 22 and WMRA 23-24. During that time frame, none of the abstracts submitted for WMRA 23-24 were accessible outside of the IAEA. With the implementation of the Internet-based submission for WMRA, and combined with the automated "in-house" administrative system, abstracts in WMRA 25 were accessible via the Internet at the URL listed below as soon as they are authorized for publication by the WMRA Programme Officer.

http://www.iaea.org/cgi-bin/irais.showwmt.pl?wmwmra.wmt

Depending upon Agency workload, some abstracts were authorized and became accessible on the Internet the same day that they are submitted to the IAEA.

Individual abstracts may be viewed via the cited URL. In addition, searches may be carried out to find and view abstracts according to various search criteria, such as by volume, by waste management topic code, by specific database fields (such as title, country, principal investigator), et cetera. As such, for volumes 25 and onward, it will not be necessary to wait until a collection of abstracts is published - abstracts may be viewed interactively via the Internet as soon as they are authorized.

Even though they are directly accessible via the Internet, collections of abstracts in WMRA 25 and future WMRA volumes are or will be published on CD ROM to assist persons that may have difficulty accessing abstracts via the Internet.

WMRA 25 is a collection of Adobe[tm] Acrobat[tm] PDF files. In addition to being published on CD ROM, WMRA 25 may be downloaded from the cited URL. After downloading during a brief on-line session, users can work with WMRA 25 off line.

Volume 23-24, also a collection of PDF files, may be ordered on CD ROM or downloaded from the cited URL.

The database that holds the abstracts for WMRA 23-24 and WMRA 25 also contains the abstracts for WMRA 22. It should noted that WMRA 22 data were converted and loaded from a different electronic format. Thus slight differences in content and print format may appear when compared to later WMRA volumes. Although already in printed form, WMRA 22 data were “back loaded” to enable full text search and query functions via the Internet at the cited URL. The collection of abstracts in WMRA 22 is available only in printed form, which may be ordered from the cited URL.

Volumes of Waste Management Research Abstracts are available free of charge, on request, to governmental and private organizations and to researchers. To order additional copies of volumes, please use the electronic request form on the cited URL or mail a request to:

Waste Management Research Abstracts
Division of Nuclear Fuel Cycle and Waste Technology
International Atomic Energy Agency
PO Box 100
A-1400 Vienna
Austria

The collection of waste management research abstracts is made possible by the continued participation of researchers who are willing to invest the time and effort necessary to complete abstract forms or to submit information about their research via the Internet. The work of the Resident Missions to the IAEA in Vienna and the other governmental organizations in Member States who co-ordinated the submission of these abstracts is greatly appreciated.

This report was prepared by G.W. Csullog, Division of Nuclear Fuel Cycle and Waste Technology.

INTRODUCTION TO WMRA 25

It is with pleasure that the International Atomic Energy Agency presents the twenty-fifth issue of the Waste Management Research Abstracts (WMRA). This issue contains 297 abstracts that describe research in progress in the field of radioactive waste management. The abstracts present ongoing work in 10 countries and an international organization. Although the abstracts are indexed by country, many programmes are actually the result of co-operation among several countries. Indeed, a primary reason for providing this compilation of programmes, institutions and scientists engaged in research into radioactive waste management is to increase international co-operation and facilitate communications.

Data provided by researchers for publication in WMRA 25 were entered into a research in progress database named IRAIS (International Research Abstracts Information System). The IRAIS database is available via the Internet at the following URL:

http://www.iaea.org/programmes/irais/

This database will continue to be updated as new abstracts are submitted by researchers world-wide.

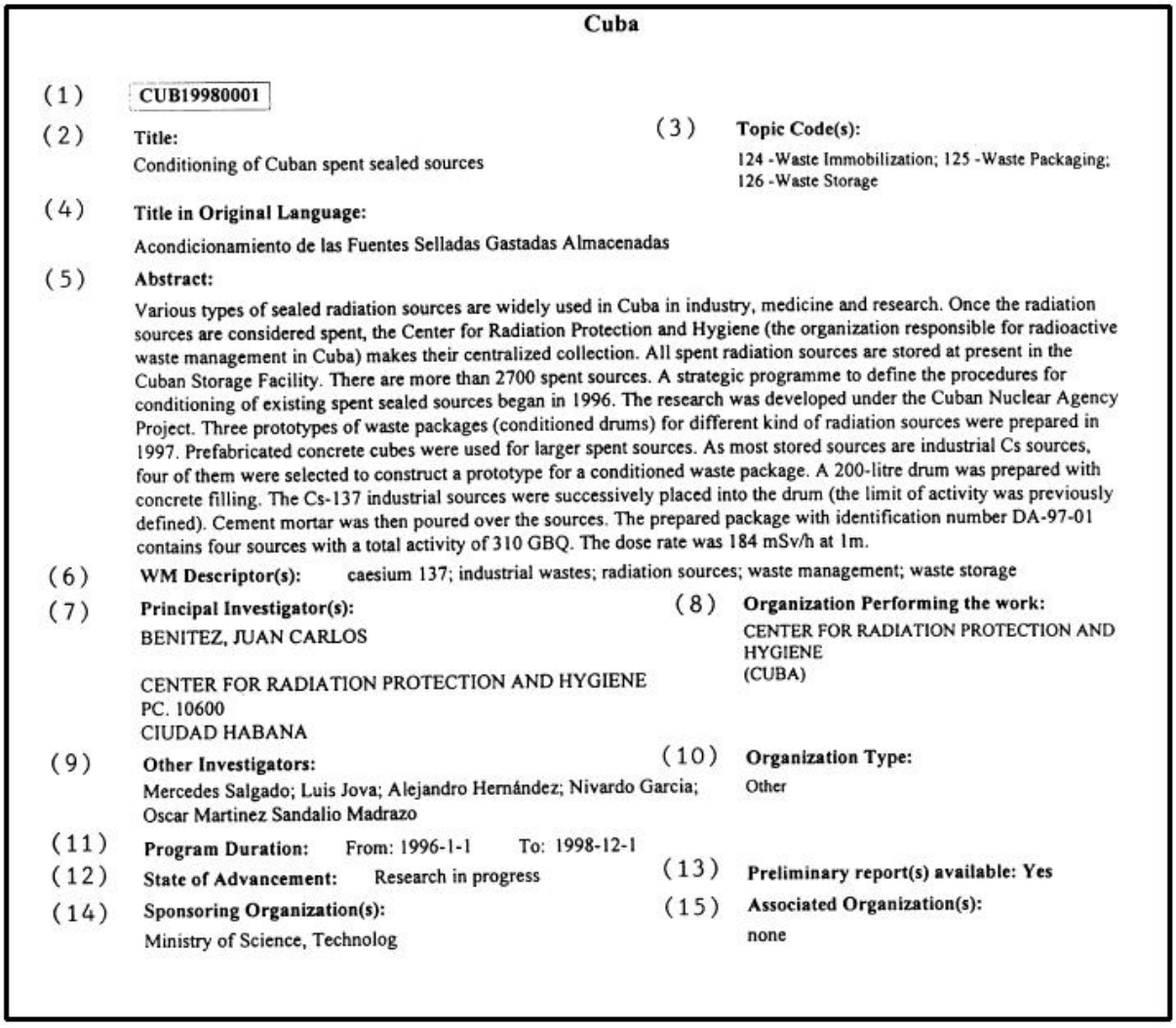
The format of WMRA 25 is similar to that used for WMRA 23-24. The abstracts are listed by country (full name) in alphabetical order. All abstracts are in English. The volume includes six indexes by: principal investigator, title, performing organization, descriptors (key words), topic codes and country. Figure 1 provides a description of the elements of an abstract.

Internet access to WMRA supports a variety of search functions and allows searching by words or phrases included in the texts of the abstracts. When performing searches, users should take note of the following conventions used in full texts:

isotope numbers: ^{60}Co, ^{235}U etc. are represented by Co-60, U-235 etc.
chemical formulas: UO_2, H_2O, Fe_2O_3 etc. are represented by UO2, H2O, Fe2O3, etc.
m^2 is represented by m^2 but m^3 is written out in full as ‘cubic metres’
ms^{-1} is represented by ‘m per s’ and **Bqm^{-3}** by ‘Bq per cubic metre’
exponentials are written out, for example ‘10 to the power of 20’ is used in place of 10^{20}

A list of waste management topic codes can be found starting on page viii.

FIGURE 1 Elements of an Abstract



Cuba

(1) **CUB19980001**

(2) **Title:**
Conditioning of Cuban spent sealed sources

(3) **Topic Code(s):**
124 -Waste Immobilization; 125 -Waste Packaging; 126 -Waste Storage

(4) **Title in Original Language:**
Acondicionamiento de las Fuentes Selladas Gastadas Almacenadas

(5) **Abstract:**
Various types of sealed radiation sources are widely used in Cuba in industry, medicine and research. Once the radiation sources are considered spent, the Center for Radiation Protection and Hygiene (the organization responsible for radioactive waste management in Cuba) makes their centralized collection. All spent radiation sources are stored at present in the Cuban Storage Facility. There are more than 2700 spent sources. A strategic programme to define the procedures for conditioning of existing spent sealed sources began in 1996. The research was developed under the Cuban Nuclear Agency Project. Three prototypes of waste packages (conditioned drums) for different kind of radiation sources were prepared in 1997. Prefabricated concrete cubes were used for larger spent sources. As most stored sources are industrial Cs sources, four of them were selected to construct a prototype for a conditioned waste package. A 200-litre drum was prepared with concrete filling. The Cs-137 industrial sources were successively placed into the drum (the limit of activity was previously defined). Cement mortar was then poured over the sources. The prepared package with identification number DA-97-01 contains four sources with a total activity of 310 GBQ. The dose rate was 184 mSv/h at 1m.

(6) **WM Descriptor(s):** caesium 137; industrial wastes; radiation sources; waste management; waste storage

(7) **Principal Investigator(s):**
BENITEZ, JUAN CARLOS

CENTER FOR RADIATION PROTECTION AND HYGIENE
PC. 10600
CIUDAD HABANA

(8) **Organization Performing the work:**
CENTER FOR RADIATION PROTECTION AND HYGIENE
(CUBA)

(9) **Other Investigators:**
Mercedes Salgado; Luis Jova; Alejandro Hernández; Nivardo Garcia; Oscar Martinez Sandalio Madrazo

(10) **Organization Type:**
Other

(11) **Program Duration:** From: 1996-1-1 To: 1998-12-1

(12) **State of Advancement:** Research in progress

(13) **Preliminary report(s) available: Yes**

(14) **Sponsoring Organization(s):**
Ministry of Science, Technolog

(15) **Associated Organization(s):**
none

FIGURE 1 (continued)

1	Reference Number	A unique identifier for each entry, in bold face, starting with the ISO code for the country followed by the year of update (four digits) and a four-digit number assigned in ascending numerical order.
2	Title	English title of the abstract.
3	Topic Code(s)	Radioactive waste management subject category codes. A list of these codes can be found starting on page vii-ix.
4	Title in Original Language	(optional) For work originally prepared in a language other than English, the title in the original language may be included here. Please note that non-Roman characters are not supported.
5	Abstract	All abstracts are printed in English. For the representation of special characters such as chemical formulas, isotope numbers etc. see the information given in the Introduction.
6	WM Descriptor(s)	Descriptors or key words taken from the Radioactive waste management Thesaurus. The assigned descriptors are indexed in this volume and represent an additional search possibility.
7	Principal Investigator	The name of the primary researcher or author contributing to the document. Corporate/organization authors are also cited where applicable.
8	Organization Performing the work	Name and location of the primary author/investigator.
9	Other Investigator(s)	Name(s) of other researcher(s) or collaborator(s).
10	Organization Type	The type of organization where the research is being performed: an institution of higher education; a foundation or laboratory for research and/or development; private industry; or other.
11	Program Duration	The start and finish dates are given in the format YYYY-MM-DD.
12	State of Advancement	State of the research: research planned or in progress.
13	Preliminary report(s) available	Yes or no.
14	Sponsoring Organization(s)	The organization providing the funding for the research.
15	Associated Organization(s)	Any other organization(s) also performing the research.

WASTE MANAGEMENT TOPIC CODES

10 - RADIOACTIVE WASTE

100 - RADIOACTIVE WASTE - GENERAL

- **101 - General policies**
- **102 - Programme Strategy, Planning and Management**
- **103 - Effluents and Discharges**
- **104 - Database & Information Systems, including Technology Transfer Systems. Technical Assistance and Costs**
- **105 - Waste Minimisation**
- **106 - Quality Assurance Aspects**
- **108 - Waste Management System Analysis**
- **109 - Waste Characterisation (Radionuclide Inventory Determination), including Computer Codes and Measuring Methods and Techniques**

110 - LOW AND INTERMEDIATE LEVEL WASTE FROM NFC FACILITIES

- **111 - Gaseous Waste Treatment**
- **112 - Liquid Waste Treatment**
- **113 - Solid Waste Treatment**
- **114 - Waste Immobilization (Bituminization, Cementation, Including Tests of Properties, Leaching Studies)**
- **115 - Waste Packaging**
- **116 - Waste Storage**
- **117 - Waste Disposal**
- **118 - Waste Transportation (Methods, Containers, Transportation Means)**

120 - RADIOACTIVE WASTE FROM NON-NFC SOURCES

- **121 - Gaseous Waste Treatment**
- **122 - Liquid Waste Treatment**
- **123 - Solid Waste Treatment**
- **124 - Waste Immobilization**
- **125 - Waste Packaging**
- **126 - Waste Storage**
- **127 - Waste Disposal**

130 - HIGH LEVEL WASTE

- **131 - Gaseous Waste Treatment**
- **132 - Liquid Waste Treatment**
- **133 - Solid Waste Treatment**
- **134 - Waste Immobilization/Vitrification (including Heat Transfer, Leaching and Other Studies)**
- **135 - Waste Packaging (Canister Types, Materials, Corrosion Studies)**
- **136 - Waste Storage**
- **137 - Waste Disposal (including Spent Fuel)**
- **138 - Waste Transportation (Methods, Containers, etc.)**

140 - SPENT FUEL

- **141 - Spent Fuel Immobilization/Conditioning**
- **142 - Spent Fuel Packaging (Canisters, Materials. etc.)**
- **143 - Spent Fuel Storage**
- **144 - Spent Fuel Immobilization/Conditioning**
- **145 - Spent Fuel Packaging (Canisters, Materials. etc.)**
- **146 - Spent Fuel Storage**
- **148 - Spent Fuel Transportation (Methods, Casks, etc.)**

150 - ALPHA BEARING/TRU WASTE

- **151 - Gaseous Waste Treatment**
- **152 - Liquid Waste Treatment**
- **153 - Solid Waste Treatment**
- **154 - Waste Immobilization**
- **155 - Waste Packaging**
- **156 - Waste Storage**
- **157 - Waste Disposal**
- **158 - Waste Transportation (Methods, Containers, etc.)**
- **159 - Recovery of Radionuclides from the Waste**

160 - HAZARDOUS/MIXED WASTE

- **161 - Biodegradation/Biotreatment**
- **162 - Liquid Waste Treatment**
- **163 - Solid Waste Treatment**
- **164 - Waste Immobilization**
- **165 - Waste Packaging**
- **166 - Waste Storage**
- **167 - Waste Disposal**
- **168 - Waste Transportation (Methods, Containers, etc.)**
- **169 - Removal/Recycling of Organics**
- **171 - Technologies and Methodologies**
- **174 - Rehabilitation of Mill Tailings**

180 - WASTE CHARACTERIZATION

- **181 - Methodologies, Analytical Methods, Measurements Instrumentation**
- **182 - Waste from form characterization**
- **183 - Waste packages characterization**
- **184 - Mixed waste characterization**
- **185 - Radionuclide characterization in storage tanks**
- **186 - Radionuclide characterization in drums**
- **187 - Radionuclide characterization in-situ**
- **188 - Radionuclide scanning**
- **191 - ROHE in waste management facilities**
- **192 - ROHE in laboratories**
- **193 - ROHE in site characterization**
- **194 - ROHE in D&D**
- **195 - ROHE in drums characterization and retrieval**
- **196 - ROHE in characterization and retrieval of buried waste**
- **197 - ROHE in characterization and retrieval of liquid waste served in underground**

20 - ENVIRONMENTAL IMPACT/ASSESSMENT STUDIES

200 - ENVIRONMENTAL IMPACT/ASSESSMENT

201 - Dispersion and Migration of Radionuclides
202 - Dispersion and Migration Models
203 - Gas Diffusion Studies
204 - Impacts from Landfill Sites

210 - BIOLOGICAL UPTAKE AND TRANSFER

211 - Biological Uptake Mechanisms and Models

220 - ENVIRONMENTAL TRANSFER

221 - Environmental Transfer Models
222 - Microbial Effects
223 - Effects of Gaseous Releases

230 - RADIOLOGICAL ASSESSMENT

231 - Radiological Assessment Models
232 - Environmental Risk Assessment
233 - Long Term Environmental Impact

240 - ENVIRONMENTAL MONITORING

241 - Monitoring Programmes
242 - Monitoring Techniques

30 - FACILITY AND/OR SITE SPECIFIC STUDIES

300 - FACILITY/SITE - GENERAL

301 - General Planning and Management
302 - Site Survey and Characterization
303 - Earth Science Models and Studies
304 - Safety Assessment and Performance Studies
305 - Design, Construction, Commissioning
306 - Barrier Studies and Tests

310 - STUDIES FOR NEAR SURFACE DISPOSAL FACILITIES

312 - Site Survey and Characterization
313 - Earth Science Studies and Models
314 - Safety Assessment and Performance Studies
315 - Design, Construction, Commissioning
316 - Barrier Studies/Tests/Impacts

320 - STUDIES FOR GEOLOGICAL REPOSITORIES

321 - General Planning and Management
322 - Site Survey and Characterization
323 - Earth Science Studies and Models
324 - Safety Assessment and Performance Studies
325 - Design, Construction, Commissioning
326 - Barrier Studies/Tests/Impacts including Near Field Effects
327 - Waste Emplacement
328 - Natural Analogue Studies