

# **Radioactive Waste Disposal and Geology**

**Konrad B. Krauskopf**

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# Radioactive Waste Disposal And Geology

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## **Radioactive Waste Disposal And Geology:**

**Radioactive Waste Disposal and Geology** Konrad Krauskopf, 1988-06-02 The perception of radioactive waste as a major problem for the industrial world has developed only recently Four decades ago the disposal of such waste was regarded as a relatively minor matter Those were the heady days when nuclear fission seemed the answer to the world's energy needs the two wartime bombs had demonstrated its awesome power and now it was to be harnessed for the production of electricity the excavation of canals even the running of cars and airplanes In all applications of fission some waste containing radioactive elements would be generated of course but it seemed only a trivial annoyance a problem whose solution could be deferred until the more exciting challenges of constructing reactors and devising more efficient weapons had been mastered So waste accumulated some in tanks and some buried in shallow trenches These were recognized as only temporary makeshift measures because it was known that the debris would be hazardous to its surroundings for many thousands of years and hence that more permanent disposal would someday be needed The difficulty of accomplishing this more lasting disposal only gradually became apparent The difficulty has been compounded by uncertainty about the physiological effects of low level radiation by the inadequacy of detailed knowledge about the behavior of engineered and geologic materials over long periods under unusual conditions and by the sensitization of popular fears about radiation in all its forms following widely publicized reactor accidents and leaks from waste storage sites

**Radioactive Waste Disposal and Geology** Konrad Krauskopf, 2013-03-07 The perception of radioactive waste as a major problem for the industrial world has developed only recently Four decades ago the disposal of such waste was regarded as a relatively minor matter Those were the heady days when nuclear fission seemed the answer to the world's energy needs the two wartime bombs had demonstrated its awesome power and now it was to be harnessed for the production of electricity the excavation of canals even the running of cars and airplanes In all applications of fission some waste containing radioactive elements would be generated of course but it seemed only a trivial annoyance a problem whose solution could be deferred until the more exciting challenges of constructing reactors and devising more efficient weapons had been mastered So waste accumulated some in tanks and some buried in shallow trenches These were recognized as only temporary makeshift measures because it was known that the debris would be hazardous to its surroundings for many thousands of years and hence that more permanent disposal would someday be needed The difficulty of accomplishing this more lasting disposal only gradually became apparent The difficulty has been compounded by uncertainty about the physiological effects of low level radiation by the inadequacy of detailed knowledge about the behavior of engineered and geologic materials over long periods under unusual conditions and by the sensitization of popular fears about radiation in all its forms following widely publicized reactor accidents and leaks from waste storage sites

**Geological Disposal of Radioactive Wastes and Natural Analogues** W. Miller, R. Alexander, N. Chapman, John C McKinley, J.A.T. Smellie, 2000-11-09 Many countries are currently

exploring the option to dispose of highly radioactive solid wastes deep underground in purpose built engineered repositories. A number of surface and shallow repositories for less radioactive wastes are already in operation. One of the challenges facing the nuclear industry is to demonstrate confidently that a repository will contain wastes for so long that any releases that might take place in the future will pose no significant health or environmental risk. One method for building confidence in the long term future safety of a repository is to look at the physical and chemical processes which operate in natural and archaeological systems and to draw appropriate parallels with the repository. For example to understand why some uranium orebodies have remained isolated underground for billions of years. Such studies are called natural analogues. This book investigates the concept of geological disposal and examines the wide range of natural analogues which have been studied. Lessons learnt from studies of archaeological and natural systems can be used to improve our capabilities for assessing the future safety of a radioactive waste repository. *Geochemical Aspects of Radioactive Waste Disposal* D. G.

Brookins, 2012-12-06 There is an extremely voluminous literature on radioactive waste and its disposal much in the form of government sponsored research reports. To wade through this mountain of literature is indeed a tedious task and it is safe to speculate that very few if any individuals have the time to examine each report that has been issued during the preceding ten years. This book attempts to summarize much of this literature. Further many workers in the geosciences have not received training in the nuclear sciences and many nuclear scientists could be better versed in geology. In this book an attempt is made to cover some background material on radioactive wastes and geotoxicity that may not be an integral part of a geologist's training and background material on geology and geochemistry for the nuclear scientist. The geochemical material is designed for both the geoscientist and the nuclear scientist. There is no specific level for this book. Certainly it should be useful to advanced undergraduates and graduates studying geology and nuclear science. It does not pretend to cover a tremendous amount of detail in all subjects yet the references cited provide the necessary source materials for follow up study. It is my intention that the reader of this book will have a better broader understanding of the geochemical aspects of radioactive waste disposal than is otherwise available in any one source. **Geological Storage of Highly Radioactive**

**Waste** Roland Pusch, 2009-07-30 The book assesses current ideas for long term disposal of highly radioactive waste. Different types of rock are discussed and assessed with respect to practical difficulties in constructing a repository and the efficiency of isolating radioactive waste. *Geology of High-Level Nuclear Waste Disposal* I.S. Roxburgh, 2012-12-06 **Disposition**

**of High-Level Radioactive Waste Through Geological Isolation** National Research Council, Division on Earth and Life Studies, Commission on Geosciences, Environment and Resources, Board on Radioactive Waste Management, 1999-10-07

During the next several years decisions are expected to be made in several countries on the further development and implementation of the geological disposition option. The Board on Radioactive Waste Management BRWM of the U S National Academies believes that informed and reasoned discussion of relevant scientific engineering and social issues can and should

play a constructive role in the decision process by providing information to decision makers on relevant technical and policy issues A BRWM initiated project including a workshop at Irvine California on November 4 5 1999 and subsequent National Academies report to be published in spring 2000 are intended to provide such information to national policy makers both in the U S and abroad To inform national policies it is essential that experts from the physical geological and engineering sciences and experts from the policy and social science communities work together Some national programs have involved social science and policy experts from the beginning while other programs have only recently recognized the importance of this collaboration An important goal of the November workshop is to facilitate dialogue between these communities as well as to encourage the sharing of experiences from many national programs The workshop steering committee has prepared this discussion for participants at the workshop It should elicit critical comments and help identify topics requiring in depth discussion at the workshop It is not intended as a statement of findings conclusions or recommendations It is rather intended as a vehicle for stimulating dialogue among the workshop participants Out of that dialogue will emerge the findings conclusions and recommendations of the National Academies report

**Geological Disposal of Radioactive Waste** Commission of the European Communities, OECD Nuclear Energy Agency. Co-ordinating Group on Geological Disposal of Radioactive Waste, 1984

**Predictive Geology** Ghislain De Marsily, Daniel F Merriam, 2013-10-22 Predictive Geology With Emphasis on Nuclear Waste Disposal covers the proceedings of papers presented at sessions sponsored by the International Association for Mathematical Geology The topics that this book tackles are issues relevant to nuclear waste disposal The first chapter discusses the use of plate tectonics as a catastrophe theoretic model and the second chapter covers geologic predictions and radioactive waste disposal Chapter 3 also talks about radioactive waste disposal with emphasis on the application of predictive geology Chapter 4 discusses salt domes and Chapter 5 tackles the use of fault tree analysis for probabilistic assessment of radioactive waste segregation The sixth chapter covers predictive geology in nuclear waste management while the seventh chapter tackles nuclear power on unstable ground The eighth chapter deals with long term thermohydrologic behavior of nuclear waste repositories Chapter 9 discusses the influence of faulting on groundwater flow and contaminant transport while chapter 10 covers the influence of microfissures in crystalline rock on radionuclide migration The eleventh chapter tackles the long term prediction of the fate of nuclear waste deeply buried in granite and the twelfth chapter talks about the use of quantitative evaluation of the contribution of geologic knowledge in exploration for petroleum The last chapter deals with resource estimation models and predicted discovery Researchers and professionals concerned with the effects of radioactive materials to the environment will find this book a great source of information

**Deep Geological Disposal of Radioactive Waste** W. R. Alexander, Linda McKinley, 2011-07-29 Deep Geological Disposal of Radioactive Waste presents a critical review of designing siting constructing and demonstrating the safety and environmental impact of deep repositories for radioactive wastes It is structured to provide a broad perspective of this multi

faceted multi disciplinary topic providing enough detail for a non specialist to understand the fundamental principles involved and with extensive references to sources of more detailed information Emphasis is very much on deep geological disposal at least some tens of metres below land surface and in many cases many hundred of metres deep Additionally only radioactive wastes are considered directly even though such wastes often contain also significant chemotoxic or otherwise hazardous components Many of the principles involved are generally applicable to other repository options e g near surface or on surface disposal and indeed to other types of hazardous waste Presents a current critical review in designing siting constructing and demonstrating the safety and environmental impact of deep repositories for radwaste Addresses the fundamental principles of radioactive waste with up to date examples and real world case studies Written for a multi disciplinary audience with an appropriate level of detail to allow a non specialist to understand Geological Disposal of Carbon Dioxide and Radioactive Waste: A Comparative Assessment Ferenc L. Toth, 2011-02-21 Fossil fuels will remain the backbone of the global energy economy for the foreseeable future The contribution of nuclear energy to the global energy supply is also expected to increase With the pressing need to mitigate climate change and reduce greenhouse gas emissions the fossil energy industry is exploring the possibility of carbon dioxide disposal in geological media Geological disposal has been studied for decades by the nuclear industry with a view to ensuring the safe containment of its wastes Geological disposal of carbon dioxide and that of radioactive waste gives rise to many common concerns in domains ranging from geology to public acceptance In this respect comparative assessments reveal many similarities ranging from the transformation of the geological environment and safety and monitoring concerns to regulatory liability and public acceptance issues However there are profound differences on a broad range of issues as well such as the quantities and hazardous features of the materials to be disposed of the characteristics of the targeted geological media the site engineering technologies involved and the timescales required for safe containment at the disposal location There are ample opportunities to learn from comparisons and to derive insights that will assist policymakers responsible for national energy strategies and international climate policies *Geologic Disposal of Low- and Intermediate-Level Radioactive Waste* Roland Pusch, Raymond N. Yong, Masashi Nakano, 2017-04-07 This book will address concepts and techniques for preparation and disposal of low LLW and intermediate level ILW radioactive waste from the nuclear industry the weapons industry university labs research institutes and from the commercial industry It will aid decision makers in finding optimal technical economical solutions including how site investigations design construction identification and selection of construction materials clay and concrete and monitoring can be made It will also examine techniques for isolating soil and rock contaminated by leaking nuclear plants and from damaged nuclear reactors such as those at the Fukushima and Chernobyl nuclear plants

**Geologic Disposal of Radioactive Waste in Perspective** OECD Nuclear Energy Agency, 2000 This report reviews the progress to date in geological disposal of radioactive waste and the further steps that may be required to implement geologic

disposal taking into account both the technical and regulatory requirements and the need to achieve an appropriate level of societal acceptance      Geological Disposal of Radioactive Waste OECD Nuclear Energy Agency. Co-ordinating Group on Geological Disposal of Radioactive Waste,1982      **Geological Repository Systems for Safe Disposal of Spent Nuclear Fuels and Radioactive Waste** Michael J Apted,Joonhong Ahn,2017-05-25 Geological Repository Systems for Safe Disposal of Spent Nuclear Fuels and Radioactive Waste Second Edition critically reviews state of the art technologies and scientific methods relating to the implementation of the most effective approaches to the long term safe disposition of nuclear waste also discussing regulatory developments and social engagement approaches as major themes Chapters in Part One introduce the topic of geological disposal providing an overview of near surface intermediate depth and deep borehole disposal spanning low medium and high level wastes Part Two addresses the different types of repository systems crystalline clay and salt also discussing methods of site surveying and construction The critical safety issue of engineered barrier systems is the focus of Part Three with coverage ranging from nuclear waste canisters to buffer and backfill materials Lastly Parts Four and Five focus on safety security and acceptability concentrating on repository performance assessment then radiation protection environmental monitoring and social engagement Comprehensively revised updated and expanded with 25% new material on topics of current importance this is the standard reference for all nuclear waste management and geological repository professionals and researchers Contains 25% more material on topics of current importance in this new comprehensive edition Fully updated coverage of both near surface intermediate depth and deep borehole disposal in one convenient volume Goes beyond the scientific and technical aspects of disposal to include the political regulatory and societal issues involved all from an international perspective      **The Scientific and Regulatory Basis for the Geological Disposal of Radioactive Waste** David Savage,1995 The disposal of radioactive waste is a central issue in the future of nuclear power and poses considerable technical political and social issues This book addresses these topics in an integrated fashion using performance assessment of the disposal concept as a unifying theme Subjects addressed include regulatory criteria waste types sources and characteristics man made or engineered barriers the selection and evaluation of geological disposal media the use of underground research laboratories the movement of radionuclides in the biosphere repository performance assessment tools and approaches addressing uncertainty and spatial variability assessing information from natural systems and looking at radioactive waste in relation to other wastes The book provides an up to date picture of radioactive waste disposal issues and will be of interest to scientists engineers and consultants working in the nuclear industry and the environmental field      The Geological Disposal of Nuclear Waste Neil A. Chapman,Ian G. McKinley,Marion D. Hill,1987-04-28 The Geological Disposal of Nuclear Waste Neil A Chapman and Ian G McKinley The disposal of radioactive wastes is becoming a central issue in the nuclear debate and any consideration of the future of nuclear power and its effect on the environment must take waste management into account Nuclear waste is currently a significant political issue in Western Europe and North America and is

becoming increasingly important in all other countries with existing or planned nuclear programmes This is the first book to tackle in a comprehensive and integrated fashion the problems associated with the geological disposal of nuclear waste International research and development launched during the last decade has enabled the authors to describe detailed concepts for the long term management and disposal of such material The level of presentation is such that readers with high school science will be able to understand the issues involved However the broad scope of coverage with references provided throughout as well as a guide to the key sources of information make this an invaluable book for both the researcher and the lay environmental scientist Rock Solid Elspeth Reid,1990 *Scientific and Technical Basis for the Geological Disposal of Radioactive Wastes* ,2003 This report focuses on the different functions of a repository within its life cycle and describes the processes relevant to the containment of long lived radioactive waste and other criteria influencing the long term integrity of the repository It emphasizes the central role of safety and the importance of safety performance assessments in the decision making process during repository development Geologic Disposal of High-Level Radioactive Waste Roland Pusch,Raymond N Yong,Masashi Nakano,2018-08-06 Geologic Disposal of High Level Radioactive Waste examines the fundamental knowledge and conditions to be considered and applied by planners and other professionals when establishing national repository concepts and constructing repositories for the long term isolation of highly radioactive waste from surrounding crystalline rock It emphasizes the important roles of structural geology hydrogeology hydrochemistry and construction techniques It specifically examines the disposal of steel canisters with spent reactor fuel in mined repositories MR at medium depth and in very deep boreholes VDH While disposal in mined repositories has been widely tested the option of placing high level radioactive waste in deep boreholes has been considered in the US UK and elsewhere in Europe but has not yet been tested on a broad scale This book examines the possibility of safe disposal for very long periods proposing that the high salt content and density of groundwater at large depths are such that potentially contaminated water would not rise high enough to affect the more shallow biosphere Features Presents the best practices for disposal of spent fuel from nuclear reactors Assesses waste isolation capacities in short and long term perspectives and the associated risks Describes site selection principles and the economics of construction of different types of repositories Includes an appendix which provides the latest international recommendations and guidelines concerning the disposal of highly radioactive waste



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