

Handbook Of Advanced Radioactive Waste Conditioning Technologies

Handbook of Advanced Radioactive Waste Conditioning Technologies Innovative Waste Treatment and Conditioning Technologies at Nuclear Power Plants Advanced Separation Techniques for Nuclear Fuel Reprocessing and Radioactive Waste Treatment Cementitious Materials for Nuclear Waste Immobilization Nuclear Waste Management An Introduction to Nuclear Waste Immobilisation Radioactive Waste Management Materials for Nuclear Waste Immobilization Improvements of Radioactive Waste Management at WWER Nuclear Power Plants Energy Abstracts for Policy Analysis Assessment of Technologies Supported by the Office of Science and Technology Department of Energy, Results of Peer Review for Fiscal Year ... Conditioning of Alpha Bearing Wastes Assessment of Technologies Supported by the U.S. Department of Energy Office of Science and Technology Radioactive Waste Conditioning, Immobilisation, And Encapsulation Processes And Technologies Objectives, Concepts and Strategies for the Management of Radioactive Waste Arising from Nuclear Power Programmes Proceedings of the International Topical Meeting on Nuclear and Hazardous Waste Management, Spectrum ... Low and Intermediate Level Radioactive Waste Management: High level radioactive waste and spent fuel management Conditioning of Low- and Intermediate-level Radioactive Wastes Safety Series Scientific Basis for Nuclear Waste Management Michael I. Ojovan International Atomic Energy Agency Kenneth L Nash Rehab O. Abdel Rahman Man-Sung Yim Michael I. Ojovan Yu S. Tang Michael I. Ojovan International Atomic Energy Agency International Atomic Energy Agency OECD Nuclear Energy Agency Denis Alexandre International Atomic Energy Agency

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radioactive wastes are generated from a wide range of sources including the power industry and medical and scientific research institutions presenting a range of challenges in dealing with a diverse set of radionuclides of varying concentrations conditioning technologies are essential for the encapsulation and immobilisation of these radioactive wastes forming the initial engineered barrier required for their transportation storage and disposal the need to ensure the long term performance of radioactive waste forms is a key driver of the development of advanced conditioning technologies the handbook of advanced radioactive waste conditioning technologies provides a comprehensive and systematic reference on the various options available and under development for the treatment and immobilisation of radioactive wastes the book opens with an introductory chapter on radioactive waste characterisation and selection of conditioning technologies part one reviews the main radioactive waste treatment processes and conditioning technologies including volume reduction techniques such as compaction incineration and plasma treatment as well as encapsulation methods such as cementation calcination and vitrification this coverage is extended in part two with in depth reviews of the development of advanced materials for radioactive waste conditioning including geopolymers glass and ceramic matrices for nuclear waste immobilisation and waste packages and containers for disposal finally part three reviews the long term performance assessment and knowledge management techniques applicable to both spent nuclear fuels and solid radioactive waste

forms with its distinguished international team of contributors the handbook of advanced radioactive waste conditioning technologies is a standard reference for all radioactive waste management professionals radiochemists academics and researchers involved in the development of the nuclear fuel cycle provides a comprehensive and systematic reference on the various options available and under development for the treatment and immobilisation of radioactive wastes explores radioactive waste characterisation and selection of conditioning technologies including the development of advanced materials for radioactive waste conditioning assesses the main radioactive waste treatment processes and conditioning technologies including volume reduction techniques such as compaction

this publication examines innovative technologies and strategies used in radioactive waste treatment and conditioning at nuclear power plants or which have important potential for use as part of the long range strategy focusing on low and intermediate level wastes *lilw* for water cooled reactors aspects discussed include applicable waste streams benefits and impacts of each technology current applications within the nuclear field and non technical approaches

advanced separations technology is key to closing the nuclear fuel cycle and relieving future generations from the burden of radioactive waste produced by the nuclear power industry nuclear fuel reprocessing techniques not only allow for recycling of useful fuel components for further power generation but by also separating out the actinides lanthanides and other fission products produced by the nuclear reaction the residual radioactive waste can be minimised indeed the future of the industry relies on the advancement of separation and transmutation technology to ensure environmental protection criticality safety and non proliferation i e security of radioactive materials by reducing their long term radiological hazard advanced separation techniques for nuclear fuel reprocessing and radioactive waste treatment provides a comprehensive and timely reference on nuclear fuel reprocessing and radioactive waste treatment part one covers the fundamental chemistry engineering and safety of radioactive materials separations processes in the nuclear fuel cycle including coverage of advanced aqueous separations engineering as well as on line monitoring for process control and safeguards technology part two critically reviews the development and application of separation and extraction processes for nuclear fuel reprocessing and radioactive waste treatment the section includes discussions of advanced purex processes the urex concept fission product separations and combined systems for simultaneous radionuclide extraction part three details emerging and innovative treatment techniques initially reviewing pyrochemical processes and engineering highly selective compounds for solvent extraction and developments in partitioning and transmutation processes that aim to close the nuclear fuel cycle the book concludes with other advanced techniques such as solid phase extraction supercritical fluid and ionic liquid extraction and biological treatment processes with its distinguished international team of contributors advanced separation techniques for nuclear fuel reprocessing and radioactive waste treatment is a standard reference for all nuclear waste management and nuclear safety professionals radiochemists academics and researchers in this field a comprehensive and timely reference on nuclear fuel reprocessing and radioactive waste treatment details emerging and innovative treatment techniques reviewing pyrochemical processes and engineering as well as highly selective compounds for solvent extraction discusses the development and application of separation and extraction processes for nuclear fuel reprocessing and radioactive waste treatment

cementitious materials are an essential part in any radioactive waste disposal facility conditioning processes such as cementation are used to convert waste into a stable solid form that is insoluble and will prevent dispersion to the surrounding environment it is incredibly important to understand the long term behavior of these materials this book summarises approaches and current practices in use of cementitious materials for nuclear waste immobilisation it gives a unique description of the most important aspects of cements as nuclear waste forms starting with a description of wastes analyzing the cementitious systems used for immobilization and describing the technologies used and ending with analysis of cementitious waste forms and their long term behavior in an envisaged disposal environment extensive research has been devoted to study the feasibility of using cement or cement based materials in immobilizing and solidifying different radioactive wastes however these research results are scattered this work provides the reader with both the science and technology of the immobilization process and the cementitious materials used to immobilize nuclear waste it summarizes current knowledge in the field and highlights important areas that need more investigation the chapters include introduction portland cement alternative cements cement characterization and testing radioactive waste cementation waste cementation technology cementitious wasteform durability and performance assessment

this book lays a comprehensive foundation for addressing the issue of safety in the lifecycle of nuclear waste with the focus on the fundamental principles the book covers key technical approaches to safety in the management of spent nuclear fuel reprocessed high level waste low level waste and decommissioning wastes behaviors of nuclear waste in natural and engineered systems in relation

to safety assessment are also described through the explanation of fundamental processes for any country involved with the use of nuclear power nuclear waste management is a topic of grave importance although many countries have heavily invested in nuclear waste management having a successful national program still remains a major challenge this book offers substantial guidance for those seeking solutions to these problems as the problem of nuclear waste management is heavily influenced by social factors the connection between technical and social issues in nuclear waste management is also discussed the book is a core text for advanced students in nuclear and environmental engineering and a valuable reference for those working in nuclear engineering and related areas

drawing on the authors extensive experience in the processing and disposal of waste an introduction to nuclear waste immobilisation second edition examines the gamut of nuclear waste issues from the natural level of radionuclides in the environment to geological disposal of waste forms and their long term behavior it covers all important aspects of processing and immobilization including nuclear decay regulations new technologies and methods significant focus is given to the analysis of the various matrices used especially cement and glass with further discussion of other matrices such as bitumen the final chapter concentrates on the performance assessment of immobilizing materials and safety of disposal providing a full range of the resources needed to understand and correctly immobilize nuclear waste the fully revised second edition focuses on core technologies and has an integrated approach to immobilization and hazards each chapter focuses on a different matrix used in nuclear waste immobilization cement bitumen glass and new materials keeps the most important issues surrounding nuclear waste such as treatment schemes and technologies and disposal at the forefront

a complete overview of sources of radioactive waste this book highlights the issues involved in safe transportation and decontamination as well as in decommissioning of nuclear facilities it covers radioactive decay and radiation shielding calculations management and disposal of spent nuclear fuel and high level waste low level waste transuranic waste uranium mill tailings and mixed waste it discusses technical and regulatory aspects of waste management and provides a look at historical record and its influence on current policy

the book outlines recent advances in nuclear wasteform materials including glasses ceramics and cements and spent nuclear fuel it focuses on durability aspects and contains data on performance of nuclear wasteforms as well as expected behavior in a disposal environment

the focus of this report is on the low and intermediate level radioactive wastes generated and managed during the normal operating life of wwer nuclear power plants it identifies mechanisms for reducing the generation and disposal volumes of radioactive waste at wwer reactors and compares the waste management approaches of western pwr and wwer reactors to identify reasons why pwrs currently have lower waste generation storage and disposal volumes examining historical trends in plant design and waste management approaches it seeks to identify those changes which contribute most significantly to today's differences between pwrs and wwrs in generation and disposal volumes the report determines the role of waste storage in promoting implementation of improved or advanced waste minimization technologies and approaches and proposes recommendations for improving wwer waste minimization

the objective of this report is to present state of the art information on assessments of the complex options available in the management of alpha bearing wastes from the reprocessing of spent fuels and mox fuel fabrication

in august 1996 asme in cooperation with the office of science and technology ost of the u s department of energy established a process and infrastructure to provide unbiased independent accurate and timely peer review for development of technologies supported by ost this report covers the period ending september 30 1997 ost is responsible for the development of environmental technology for management of waste generated within doe and environmental restoration of sites contaminated through past activities of doe and its predecessors these technologies have far reaching global impact of the enhancement of environmental protection in the past ost has relied on a variety of reviews to ensure that technological developments are consistent with stated goals the establishment of a peer review program is a logical extension to these review activities contents includes manual for peer review review reports final reports interim reports consensus reports recommendations and bibliographic summaries sampling of report topics alternative landfill cover demonstration proposals for mercury separation removal plasma hearth process buried waste containment systems and etc

the main immobilization technologies that are available commercially and have been demonstrated to be viable are cementation bituminization and vitrification. Vitrification is currently the most widely used technology for the treatment of high level radioactive wastes. HLW throughout the world most of the nations that have generated HLW are immobilizing in either alkali borosilicate glass or alkali aluminophosphate glass. The exact compositions of nuclear waste glasses are tailored for easy preparation and melting. Avoidance of glass in glass phase separation, avoidance of uncontrolled crystallization and acceptable chemical durability, e.g. leach resistance, glass has also been used to stabilize a variety of low level wastes (LLW) and mixed radioactive and hazardous low level wastes (MLLW) from other sources such as fuel rod cladding, de-cladding processes, chemical separations, radioactive sources, radioactive mill tailings, contaminated soils, medical research applications and other commercial processes. The sources of radioactive waste generation are captured in other chapters in this book regarding the individual practices in various countries. Legacy wastes currently generated wastes and future waste generation is primarily driven by interest in sources of clean energy and this has led to an increased interest in advanced nuclear power production. The development of advanced wasteforms is a necessary component of the new nuclear power plant (NPP) flowsheets. Therefore, advanced nuclear wasteforms are being designed for robust disposal strategies. A brief summary is given of existing and advanced wasteforms: glass, glass ceramics, glass composite materials, GCMs, and crystalline ceramic mineral wasteforms that chemically incorporate radionuclides and hazardous species atomically in their structure. Cementitious geopolymers, bitumen and other encapsulant wasteforms and composites that atomically bond and encapsulate wastes are also discussed. The various processing technologies are cross-referenced to the various types of wasteforms since often a particular type of wasteform can be made by a variety of different processing technologies.

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