Thermodynamics Of Nuclear Materials 1979

Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

Materials in a nuclear environment are exposed to extreme conditions of radiation, temperature and/or corrosion, and in many cases the combination of these makes the material behavior very different from conventional materials. This is evident for the four major technological challenges the nuclear technology domain is facing currently: (i) long-term operation of existing Generation II nuclear power plants, (ii) the design of the next generation reactors (Generation IV), (iii) the construction of the ITER fusion reactor in Cadarache (France), (iv) and the intermediate and final disposal of nuclear waste. In order to address these challenges, engineers and designers need to know the properties of a wide variety of materials under these conditions and to understand the underlying processes affecting changes in their behavior, in order to assess their performance and to determine the limits of operation. Comprehensive Nuclear Materials 2e provides broad ranging, validated summaries of all the major topics in the field of nuclear material research for fission as well as fusion reactor systems. Attention is given to the fundamental scientific aspects of nuclear materials: fuel and structural materials for fission reactors, waste materials, and materials for fusion reactors. The articles are written at a level that allows undergraduate students to understand the material, while providing active researchers with a ready reference resource of information. Most of the chapters from the first Edition have been revised and updated and a significant number of new topics are covered in completely new material. During the ten years between the two editions, the challenge for applications of nuclear materials has been significantly impacted by world events, public awareness, and technological innovation. Materials play a key role as enablers of new technologies, and we trust that this new edition of Comprehensive Nuclear Materials has captured the key recent developments. Critically reviews the major classes and functions of materials, supporting the selection, assessment, validation and engineering of materials in extreme nuclear environments Comprehensive resource for up-to-date and authoritative

information which is not always available elsewhere, even in journals Provides an in-depth treatment of materials modeling and simulation, with a specific focus on nuclear issues Serves as an excellent entry point for students and researchers new to the field

Unlike earlier books in this series, this review describes the selection of chemical thermodynamic data for species of two elements, neptunium and plutonium. Although this came about more by circumstance than design, it has allowed for a more consistent approach to chemical interpretation than might have occurred in two separate treatments. It has also drawn attention to cases where the available data do not show expected parallels, and where further work may be useful to confirm or refute apparent differences in the behaviour of neptunium and plutonium.

proceedings of an Internat. Symposium on Thermodynam. of Nuclear Materials ; in 2 vol

Fusion Energy Update

Delft, The Netherlands, June 12-13, 1980

Mass Transport in Solids

Thermodynamics of Nuclear Materials 1979

Structural Alloys for Nuclear Energy Applications

Proceedings of a Symposium on the Thermodynamics of Nuclear Materials

Nuclear Safety

INIS Atomindeks

Synthesis of Lanthanide and Actinide Compounds

Twelfth International Symposium : a Symposium

The first edition of this work appeared almost thirty years ago, when, as we can see in retrospect, the study of the actinide elements was in its first bloom. Although the broad features of the chemistry of the actinide elements were by then quite well delineated, the treatment of the subject in the first edition was of necessity largely descriptive in nature. A detailed understanding of the chemical consequences of the characteristic presence of Sf electrons in most of the members of the actinide series was still for the future, and many of the systematic features of the actinide elements were only dimly apprehended. In the past thirty years all this has changed. The application of new spectroscopic techniques, which came into general use during this period, and new theoretical insights, which came from a better understanding of chemical bonding, inorganic

chemistry, and solid state phenomena, were among the important factors that led to a great expansion and maturation in actinide element research and a large number of new and important findings. The first edition consisted of a serial description of the individual actinide elements, with a single chapter devoted to the six heaviest elements (lawrencium, the heaviest actinide, was yet to be discovered). Less than 15 % of the text was devoted to a consideration of the systematics of the actinide elements.
Liquid metal technology has been the subject of an impetuous development in the recent decades, mainly due to the application of liquid met als in nuclear techniques. The technological development has been supported by studies of the basic physical-chemical properties of liquid metals: One major concern is the material behaviour in contact with the liquid metals, corrosion and the possible deterioration of metallic and ceramic materials which are in use as constructional or functional materials in such systems. Since the corrosion is in many cases not only a simple dissolution process, the chemical background of such processes had to be studied. Such studies included the determination of solubilities of metals and non-metals in liquid metals, the measurement of thermodynamic data of dissolved materials and of chemical equilibria. Several formerly unknown chemical compounds are formed in liquid metal~ lnd are only stable in this environment. The research and deve\opment devoted to the fission reactor techniques were more or less completed in several countries, further work is in progress in some countries in which the interest in fast breeder reactors arose recently. Even the worldwide program on fusion reactor technology is related to liquid metals, and severallaboratories are now contributing to this new technology.
The fourth edition of "The Chemistry of the Actinide and Transactinide Elements" comprises all chapters in volumes 1 through 5 of the third edition (published in 2006) plus a new volume 6. To remain consistent with the plan of the first edition, " ... to provide a comprehensive and uniform treatment of the chemistry of the actinide [and transactinide] elements for both the nuclear technologist and the inorganic and physical chemist," and to be consistent with the maturity of the field, the fourth edition is organized in three parts. The first group of

chapters follows the format of the first and second editions with chapters on individual elements or groups of elements that describe and interpret their chemical properties. A chapter on the chemical properties of the transactinide elements follows. The second group, chapters 15–26, summarizes and correlates physical and chemical properties that are in general unique to the actinide elements, because most of these elements contain partially-filled shells of 5f electrons whether present as isolated atoms or ions, as metals, as compounds, or as ions in solution. The third group, chapters 27–39, focuses on specialized topics that encompass contemporary fields related to actinides in the environment, in the human body, and in storage or wastes. Two appendices at the end of volume 5 tabulate important nuclear properties of all actinide and transactinide isotopes. Volume 6 (Chapters 32 through 39) consists of new chapters that focus on actinide species in the environment, actinide waste forms, nuclear fuels, analytical chemistry of plutonium, actinide chalcogenide and hydrothermal synthesis of actinide compounds. The subject and author indices and list of contributors encompass all six volumes.

Current Engineering Practice

Proceedings of an International Symposium on Nuclear Materials Held by the IAEA in Jülich, Federal Republic of Germany, from 29 January to 2 February, 1979

The Chemistry of the Actinide Elements

Physikalische Berichte

Bibliography on the High Temperature Chemistry and Physics of Materials

Physics Briefs

Faraday transactions. Molecular and chemical physics. II

INIS Atomindex

Water Reactor Fuel Element Performance Computer Modelling

U Uranium

Thermodynamics of Nuclear Materials, 1979

This book presents the state of the art on thermophysical and thermochemical properties, fabrication methodologies, irradiation behaviours, fuel reprocessing procedures, and aspects of waste management for oxide fuels in general and for thoria-based fuels in particular. The book covers all the essential features involved in the development of and working with nuclear technology. With the help of key databases, many of which were created by the authors, information is presented in the form of tables, figures, schematic diagrams and flow sheets, and photographs. This information will be useful for scientists and engineers working in the nuclear field, particularly for design and simulation, and for establishing the technology. One special feature is the inclusion of the latest

information on thoria-based fuels, especially on the use of thorium in power generation, as it has less proliferation potential for nuclear weapons. Given its natural abundance, thorium offers a future alternative to uranium fuels in nuclear technology. In closing, the latest information on conventional uranium and plutonium fuels is also provided.

In the beginning of the 1990's, in the course of the events which were rapidly cha- ing the political con?guration of the East European countries, the crisis which - vested the vast research apparatus of the former Soviet Union was entailing con- quences whose dimension and depth were immediately realized by the international scienti?c community. In the same years, however, the most important branch of nuclear energy - searchanddevelopment,inparticularthatconcerning?ssionreactor,wasworldwide undergoing a substantial reduction due to a variety of decisional situations. Yet, paradoxically, it was a very good fortune that a number of concerns on the future of nuclear research were shared by East- and West-European scientists, especially those who were working in advanced ?elds. In fact, the only hope for coping with an uncertain future was to erect bridges between similar institutions and employ safeguarding tactics linked to a long term collaboration strategy. A decade later, this proved to be a winning decision, since the revival of nuclear energy is presently starting from a basis of common intentions and a network of established cooperation, whose seeds are to be searched in those initial, individual e?orts.

The status of the following studies is given: calorimetry and thermodynamics of nuclear materials; americium recovery and purification; optimization of the cation exchange process for recovering americium and plutonium from molten net extraction residues; evaluation and comparison of bidentate extractants and methods for actinide recovery; a combined anion exchange-bidontate organophosphorus extraction process for molten salt extraction residues; a combined anion exchange-extraction chromatography technique for secondary recovery; plutonium recovery in the Advanced Size Reduction Facility; decontamination of Rocky Flats soil; separating lead and calcium from americium by chromate and oxalate precipitation; demonstration of the pyroredox process in the induction-heated, tilt-pour furnace; process development for recovery of americium from vacuum melt furnace crucibles; plutonium peroxide precipitation process; and a comparative study of annular and Raschig ring-filled tanks.

Material Behavior and Physical Chemistry in Liquid Metal Systems 2
Journal of the Chemical Society
Comprehensive Nuclear Materials
Behavior of Uranium Fuels in Nuclear Reactors. Reprocessing of Spent Nuclear Fuels
Steam Explosion Efficiency Studies
Chemistry Research and Development. Progress Report, November 1978-April 1979
Meetings on Atomic Energy
Zirconium in the Nuclear Industry
Effects of Radiation on Materials
Liquid Metal Systems
Energy Research Abstracts

Proceedings of the International Symposium on Thermodynamics of Alloys

The present volume A4 of the "Uranium" series of the Gmelin Handbook deals with two very important technological aspects of the nuclear fuel cycle: - the behavior of fuel elements during burnup in a nuclear reactor, and - the reprocessing of spent fuel to recover the non-fissioned uranium and newly created materials. The usefullifetime of a fuel element in a

nuclear reactor depends strongly on the change of its chemical and physical properties during irradiation. Properties like thermal conductivity, swelling, creep, and oxygen-to-metal ratio are strongly affected by the intense neutron field and the energetic fission products. Furthermore, the high temperature gradient in a fuel element also produces alterations of the initial fuel. such as densification or U: Pu segregation. All of these effects are thoroughly discussed for the different kinds of fuels to be used in modern nuclear reactors today or in the future. The vast amount of very often Contradietory results in sometimes difficultly obtainable literature has been summarized to create a compendium in this field with the two sections, on oxide and on carbide and nitride fuels, respectively. The chapters on reprocessing of spent fuels deal only with fuel elements of the uranium 235 thorium fuel cycle and with those containing fuel highly enriched in U. The treatment of U0 2 and (U,Pu)0 has already been given in the transuranic element series.

The Chemistry of the Actinide and Transactinide Elements is a contemporary and definitive compilation of chemical properties of all of the actinide elements, especially of the technologically important elements uranium and plutonium, as well as the transactinide elements. In addition to the comprehensive treatment of the chemical properties of each element, ion, and compound from atomic number 89 (actinium) through to 109 (meitnerium), this multi-volume work has specialized and definitive chapters on electronic theory, optical and laser fluorescence spectroscopy, X-ray absorption spectroscopy, organoactinide chemistry, thermodynamics, magnetic properties, the metals, coordination chemistry, separations, and trace analysis. Several chapters deal with environmental science, safe handling, and biological interactions of the actinide elements. The Editors invited teams of authors, who are active practitioners and recognized experts in their specialty, to write each chapter and have endeavoured to provide a balanced and insightful treatment of these fascinating elements at the frontier of the periodic table. Because the field has expanded with new spectroscopic techniques and environmental focus, the work encompasses five volumes, each of which groups chapters on related topics. All chapters represent the current state of research in the chemistry of these elements and related fields.

Data Collection

Proceedings of an International Symposium on Nuclear Materials Held by the IAEA in Jülich, Federal Rapublic of Germany, from 29 January to 2 February, 1979

Proceedings of an International Symposium on Thermodynamics of Nuclear Materials

The Chemistry of the Actinide and Transactinide Elements (3rd ed., Volumes 1-5)

High-performance alloys that can withstand operation in hazardous nuclear environments are critical to presentday in-service reactor support and maintenance and are foundational for reactor concepts of the future. With commercial nuclear energy vendors and operators facing the retirement of staff during the coming decades, much of the scholarly knowledge of nuclear materials pursuant to appropriate, impactful, and safe usage is at risk. Led by the multi-award winning editorial team of G. Robert Odette (UCSB) and Steven J. Zinkle (UTK/ORNL) and with contributions from leaders of each alloy discipline, Structural Alloys for Nuclear Energy Applications aids the next generation of researchers and industry staff developing and maintaining steels, nickel-base alloys, zirconium alloys, and other structural alloys in nuclear energy applications. This authoritative reference is a critical acquisition for institutions and individuals seeking state-of-the-art knowledge aided by the editors' unique personal insight from decades of frontline research, engineering and management. Focuses on in-service irradiation, thermal, mechanical, and chemical performance capabilities. Covers the use of steels and other structural alloys in current fission technology, leading edge Generation-IV fission reactors, and future fusion power reactors. Provides a critical and comprehensive review of the state-of-the-art experimental knowledge base of reactor materials, for applications ranging from engineering safety and lifetime assessments to supporting the development of advanced computational models.

Atomic transport in solids is a field of growing importance in solid state physics and chemistry, and one which, moreover, has important implications in several areas of materials science. This growth is due first to an increase in the understanding of the fund amentals of transport processes in solids. Of equal importance, however, have been the improvements in the last decade in the experi mental techniques available for the investigation of transport phenomena. The advances in technique have stimulated studies of a wider range of materials; and expansion of the field has been strong ly encouraged by the increasing range of applied areas where transport processes play an essential role. For example, mass transport phenomena play a critical role in the technology of fabrication of components in the electronics industry. Transport processes are involved both during the fabrication and operation of devices and with the growing trend to miniaturisation there are increasing demands on accurate

control of diffusion processes. The present book (which is based on a NATO sponsored Advanced Study Institute held in 1981 at Lannion, France) aims to present a general survey of the subject, highlighting those areas where work has been especially active in recent years.

Proceedings of an International Symposium on Thermodynamics of Nuclear Materials Held by the International Atomic Energy Agency in Jülich, Federal Republic of Germany, from 29 January to 2 February 1979

Proceedings of the International ANS/ENS Topical Meeting on Thermal Reactor Safety, San Diego, California, U.S.A., February 2-6, 1986

Proceedings of the International Symposium on Thermodynamics of Alloys

Thoria-based Nuclear Fuels

Volumes 1-6

5th Conference

Proceedings of the Symposium

Corium experiments

Thermodynamics of nuclear materials 1979 [nineteen hundred and seventy-nine]

Scientific and Technical Aerospace Reports

The Chemistry of the Actinide and Transactinide Elements (Set Vol.1-6)