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The National Nuclear Energy Series: An Abridged Compilation

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Abstract

This report is a compilation of the volumes of the National Nuclear Energy Series (NNES). The report consists of: a selection of original prefaces from the NNES, a summary table of all of the NNES volumes, and a large appendix containing the table of contents of each volume.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the assistance of (in alphabetical order): Jack Carter (LANL Historian); Nancy Doran (PNNL); Lloyd Gnagey (formerly affiliated with Mound Laboratories); Shirley Gydesen (PNNL); Edward Hammel (LANL); Wayne Langenberg (ORNL); and Cliff Scroger (DOE Historian, Germantown).

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ABOUT THIS COMPILATION

This report is a compilation of the volumes of the National Nuclear Energy Series (NNES). The report consists of: a selection of original prefaces from the NNES, a summary table of all of the NNES volumes, and a large appendix containing the table of contents of each volume.

The National Nuclear Energy Series (NNES) was originally planned in 1945 as a means for obtaining a comprehensive formal record of the results of research and development programs and resulting scientific and technical advances that were accomplished by the Manhattan District. It was also visualized as a continuing program to record the results of the work of the Project when the Atomic Energy Commission assumed control. The NNES preface and the Introductory Note to NNES Division IV provide considerable historical insight into the intent of the series, and are reproduced in this report.

Perhaps the most interesting information in the NNES is that discussing early work in uranium enrichment and reactor theory. Many volumes on these subjects are of an engineering nature, providing significant theoretical and practical details. Most of these volumes were originally classified. Some, notably those discussing electromagnetic isotope separation, have since been declassified; others, mainly those discussing gaseous diffusion, remain classified at the date of this report.

The Introduction to the NNES, which appears in each NNES volume and is reproduced in this report, states that the NNES was expected to consist of approximately 100 volumes when completed, but none of the individual NNES volumes list these 100 volumes. Because of the unique and historic nature of the information in the NNES and its relevance to nuclear proliferation, we believed that it would be useful to the community to identify and catalog all volumes of the NNES.

The unclassified NNES volumes are well known in the open literature. Indeed, MIMC (then a division of Pergamon Press) has made the unclassified volumes available on microfilm. (The Kansas State University Library, Manhattan KS, has a complete set of these films.)

The classified (as well as the unclassified) NNES volumes are catalogued in USAEC Report TID-373, which is a largely accurate representation of the final status of the NNES. However, TID-373 lists proposed volumes that were never actually written, and there a small number of volumes that were later written but are not listed in TID-373 because they had not yet been proposed. Additionally, both TID-373 and the preface to NNES Division IV imply that the Los Alamos Technical Series (LATS) was intended to become NNES Division V. However, for security (classification) reasons, the LATS is not catalogued in TID-373.

As a result of this research, we identified 62 unclassified volumes, 17 classified volumes, and 21 volumes that were proposed but apparently never written. There are an additional 14 classified volumes in the LATS. Of the 21 unwritten volumes, some were intended to be compilations of individual papers, and sufficient proposed table-of-contents information exists for five of those volumes that they could be compiled.

Appendix F of this report reproduces the unclassified and OOU tables of contents of the NNES volumes. It is because of the omission of classified information that this volume is entitled AN ABRIDGED COMPILATION. A classified companion report to this report includes the classified titles and tables of contents.

REFERENCES

Outline of Volumes in the National Nuclear Energy Series, Technical Information Service, Oak Ridge, TN, report TID-373 (Jan. 1953) (S).

Outline of Volumes in the National Nuclear Energy Series, Technical Information Service, Oak Ridge, TN, report TID-373 (Suppl.) (Jan. 1953) (S). This report includes only the classified titles and tables of contents of NNES, division II.

NNES Published Declassified Volumes, Technical Information Service, Oak Ridge, TN, report TID-5103 (1953) (U). This volume is a subset of TID-373.

Edward F. Hammel, Documents and Related Materials Associated with the Contents and the Origin of the Los Alamos Technical Series, Los Alamos National Laboratory, report LA-13100-H (April 1996), and references therein.

Nancy P. Orlando, James R. Brangan, and Jonathan Wise, The National Nuclear Energy Series: A Compilation, Sandia National Laboratories, report SAND99-1113 (May 1999) (SRD)

Pergamon Microforms International Marketing Company (MIMC), (Elmsford NY) advertisement. This ad is reproduced in E.F.Hammel, LA-13100-H.

R.E. Zirkle, National Nuclear Energy Series, Division IV: Arrangement of Collected Papers in Radiobiology for Publication, Argonne National Laboratory, report ANL-5003494; AEC report DE85003494 (March 1948). All information in this report is also included in TID-373.

APPENDIX A: NNES Preface

This volume is one of a series which has been prepared as a record of the research work done under the Manhattan Project and the Atomic Energy Commission. The name Manhattan Project was assigned by the Corps of Engineers, War Department, to the far-flung scientific and engineering activities which had as their objective the utilization of atomic energy for military purposes. In the attainment of this objective, there were many developments in scientific and technical fields which were of general interest. The National Nuclear Energy Series (Manhattan Project Technical Section) is a record of these scientific and technical contributions, as well as of the developments in these fields which are being sponsored by the Atomic Energy Commission.

The National Nuclear Energy Series, when completed, is expected to consist of approximately 100 volumes. These will be grouped into ten divisions, as follows:

- Division I - Electromagnetic Separation Project
- Division II - Gaseous Diffusion Project
- Division III - Special Separations Project
- Division IV - Plutonium Project
- Division V - Los Alamos Project
- Division VI - University of Rochester Project
- Division VII - Materials Procurement Project
- Division VIII - Manhattan Project
- Division IX - Thermal Diffusion Project
- Division X - Centrifuge Project

Soon after the close of the war the Manhattan Project was able to give its attention to the preparation of a complete record of the research work accomplished under Project contracts. Writing programs were authorized at all laboratories, with the object of obtaining complete coverage of Project results. Each major installation was requested to designate one or more representatives to make up a committee, which was called first the Manhattan Project Editorial Advisory Board and later simply the Project Editorial Advisory Board. This group was planned to coordinate the writing programs at all installations and to act as an advisory group in all matters affecting the Project-wide writing program.

The names of the Board members and of the installations which they represented are as follows:

Atomic Energy Commission Public and Technical Information Service Technical Information Division, Oak Ridge Extension Office of New York Operations	Alberto F. Thompson Brewer F. Boardman Charles Slessor, J. H. Hayner, W. M. Hearon*
Brookhaven National Laboratory	Richard W. Dodson
Carbide & Carbon Chemicals Corporation (K-25)	R. B. Korsmeyer, W. L. Harwell, D. E. Hull, Ezra Staple
Carbide & Carbon Chemicals Corporation (Y-12)†	Russell Baldock
Clinton Laboratories ‡	J. R. Coe
General Electric Company, Hanford General Electric Company, Knolls Atomic Power Laboratory	T. W. Hauff J. P. Howe
Kellex Corporation	J. F. Hogerton, Jerome Simson, M. Benedict
Los Alamos	R. R. Davis, Ralph Carlisle Smith
National Bureau of Standards	C. J. Rodden
Plutonium Project Argonne National Laboratory Iowa State College Medical Group	R. S. Mulliken, H. D. Young F. H. Spedding R. E. Zirkle
SAM Laboratories §	G. M. Murphy
Stone & Webster Engineering Corporation	B. W. Whitehurst
University of California	R. K. Wakerling, A. Guthrie
University of Rochester	D. R. Charles, M. J. Wantman

* Represented Madison Square Area of the Manhattan District.

† The Y-12 plant at Oak Ridge was operated by Tennessee Eastman Corporation until May 4, 1947, at which time operations were taken over by Carbide & Carbon Chemicals Corporation

‡ Clinton Laboratories was the former name of the Oak Ridge National Laboratory.

§ SAM (Substitute Alloy Materials) was the code name for the laboratories operated by Columbia University in New York under the direction of Dr. H. C. Urey, where much of the experimental work on isotope separation was done. On Feb. 1, 1945, the administration of these laboratories became the responsibility of Carbide & Carbon Chemicals Corporation. Research in progress there was transferred to the K-25 plant at Oak Ridge in June, 1946, and the New York Laboratories were then closed.

Many difficulties were involved in preparing a unified account of Atomic Energy Project work. For example, the Project Editorial Advisory Board was the first committee ever organized with the representatives from every major installation of the Atomic Energy Project. Compartmentation for security was so rigorous during the war that it had been considered necessary to allow a certain amount of duplication of effort rather than to permit unrestricted circulation of research information between certain installations. As a result, the writing programs of different installations inevitably overlapped markedly in many scientific fields. The Editorial Advisory Board has exerted itself to reduce duplication in so far as possible and to eliminate discrepancies in factual data included in the volumes of the NNES. In particular, unified Project-wide volumes have been prepared on Uranium Chemistry and on the Analysis of Project Materials. Nevertheless, the reader will find many instances of differences in results or conclusions on similar subject matter prepared by different authors. This has not seemed wholly undesirable for several reasons. First of all, such divergencies are not unnatural and stimulate investigation. Second, promptness of publication has seemed more important than the removal of all discrepancies. Finally, many Project scientists completed their contributions some time ago and have become engrossed in other activities so that their time has not been available for a detailed review of their work in relation to similar work done at other installations.

The completion of the various individual volumes of the series has also been beset with difficulties. Many of the key authors and editors have had important responsibilities in planning the future of atomic energy research. Under the circumstances, the completion of this technical series has been delayed longer than its editors wished. The volumes are being released in their present form in the interest of presenting the material as promptly as possible to those who can make use of it.

As many as possible of the volumes have been declassified for general distribution. Reproduction of this classified edition has been approved only for limited circulation within the Atomic Energy Project, and circulation of this edition must be closely limited to facilities and personnel definitely associated with work done for the Atomic Energy Commission. The negatives from which the limited edition is prepared will be preserved and will be available for publication of a public edition at such time as such action is determined to be consistent with the national security.

The Editorial Advisory Board

APPENDIX B: NNES Division IV Foreward

Since the discovery of practical means of utilizing the energy of the atomic nucleus, a large and complex atomic energy industry has begun in the United States. As a result of conditions in the world, external to the United States, the requirements of national security have been paramount in our development of this industry thus far. Constant and increasing attention, however, has been given to the problems of economic nuclear power and to the medical and industrial applications of radioactive materials with a view toward "improving the public welfare, increasing the standard of living, strengthening free competition in private enterprise, and promoting world peace." To this end the Atomic Energy Commission has sought the most effective means to accelerate the practical exploitation of nuclear data by American science and industry. The National Nuclear Energy Series is designed to provide for scientists and engineers as comprehensive a source of such data as is possible. The scope of the information presented in these volumes is a measure of American achievements to date in the field of atomic science.

Lewis L. Strauss, Chairman
U.S. Atomic Energy Commission

APPENDIX C: Plutonium Project Record Foreward
(reproduced from NNES - IV - 12)

This report is a technical account of information collected while developing methods for producing plutonium. Some of the information deals directly with nuclear physics and chemistry. Most of it is related rather to technical processes that needed to be performed in preparation for making the plutonium. These publications represent selections from the great mass of current reports, made on the basis of their value to basic science and technology.

The current technical reports, written during the war years, were essential to the active work of the plutonium project. They supplied needed data and calculations to those who were planning the new processes. Selecting from this mass of records the most reliable data and presenting them in a useful form has been an enormous task, for which the writers and editors of these volumes deserve the sincere thanks of their scientific colleagues. Many fields of science and technology will develop more rapidly because of this knowledge.

The efforts of the men who did this research resulted in the successful production of atomic bombs, which shortened the war and saved the lives of many of their comrades. But in the long view of history it is probable that the major human heritage from their work will not be this quick victory. It may not even be the useful applications of atomic energy, which was first presented as a Promethean gift to man. It is not likely that the scientific information in these pages may be the starting point to new reaches of knowledge, which will give to man an understanding that will truly enrich his life

Arthur H. Compton

Important phases of the work of the Metallurgical Project that are not reported in the PPR but will be reported elsewhere in the NNES are as follows: (1) Division VII, the report of the Materials Procurement Project, includes certain early work on process metallurgy. (2) The Division VIII NNES volumes on Analytical Chemistry, which developed from two volumes originally planned as part of the PPR, contain much Metallurgical Project work, including one complete Collected Papers volume. (3) The Division VIII NNES volumes on Uranium Chemistry, which were planned and carried out under the supervision of the PPR editorial group, likewise contain much Metallurgical Project work, including one complete Collected Papers volume.

History and Plan of the Plutonium Project Record. During the war years the scientific and technical work of the Metallurgical Project and its associated laboratories was described currently in a series of reports called the "C reports." The work up to July 1, 1945 was described in some 3,000 reports. After that date the Clinton Laboratories reports became a separate series, but reports of the other units of the former Metallurgical Project continued to be issued as C reports. Most of the C reports were preliminary or semifinal reports. The main consideration during the wartime development was speed of issue and distribution.

As the mass of scientific and technical knowledge obtained on the Project piled up, an increasing need was apparent for its digestion into survey or summary form. In partial answer to this need, an editorial group was set up in the spring of 1943 to organize a Project Handbook. Although never fully completed because of the engrossment of authors in immediately urgent tasks, and because of the transfer of many of them to other sites, enough of the Project Handbook was finished to be of real value.

By the summer of 1944, the Metallurgical Project had largely concluded its major task, that of providing the scientific and pilot-plant know-how for the design of the large-scale Hanford Plutonium Plant. The time seemed ripe to plan a series of volumes in which the Project's fund of accumulated scientific and technical knowledge would be recorded. These would replace the often sketchy and sometimes mutually contradictory C reports and fill many gaps of unwritten knowledge. In the early planning, Laurence L. Quill as Chief of the Editorial Section of the Project Information Division during the summer of 1944, Eugene Rabinowitch, and H. H. Goldsmith made important contributions. After several committee meetings, a plan for the preparation of a Metallurgical Project Record was approved by the Project Director in the fall of 1944. Later, in 1945, the name was changed to Plutonium Project Report or Record (PPR).

When the PPR was organized, rigid compartmentation was still in effect between the Metallurgical Project and the other Manhattan District projects. Members of each project were in general not supposed to know even the major objectives or main outlines of the other projects. The PPR had therefore to be planned as an independent entity. Nevertheless, at its inception the idea was firmly held that later on the Record should become part of a larger series covering the work of all the atomic energy projects. This idea was repeatedly advocated and led in late 1945 to the plan for the

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work of the PPR, as part of the NNES, was taken over by the Technical Information Division of the Atomic Energy Commission, at Oak Ridge, Tenn.

In addition to those named above, many other project members worked together in planning the PPR. After the general plans were made, the actual work of preparing the various volumes was in the hands of the volume editors, volume editorial committees, and authors, as described in the prefaces of the individual volumes.

Robert S. Mulliken
Editor-in-Chief
Plutonium Project Record

APPENDIX E: Summary of National Nuclear Energy Series Volumes

Volume	Title	Authors	Classification Initial/Current	Comments
DIVISION I - ELECTROMAGNETIC SEPARATION PROJECT				
University of California Radiation Laboratory Section. Editor, R.K. Wakerling				
I-1	Vacuum Equipment and Techniques	A. Guthrie R.K. Wakerling	U	Published 1949 (McGraw-Hill).
I-1 Ch. 6	Chapter 6. Operational Techniques	W.E. Bush	S/U	Published 1952 (USAEC). Additional chapter of NNE-1-1. Report BP-45.
I-2	Magnets and Magnetic Measuring Techniques	A. Guthrie R.K. Wakerling	S/U	Published 1949 (USAEC). Report TID-5215.
I-3	Electrical Circuits for Calutrons	R.K. Wakerling A. Guthrie	S/U	Published 1949 (USAEC). Report TID-5216.
I-4	Electromagnetic Separation of Isotopes in Commercial Quantities	R.K. Wakerling A. Guthrie	S/U	Published 1951 (USAEC). Report TID-5217.
I-5	The Characteristics of Electrical Discharges in Magnetic Fields	A. Guthrie R.K. Wakerling	U	Published 1949 (McGraw-Hill).
I-6	Sources and Collectors for Use in Calutrons	R.K. Wakerling A. Guthrie	S/U	Published 1949 (USAEC). Report TID-5218.
Tennessee Eastman Corporation Section. Editors, Russell Baldock and H. Wesley Savage				
I-7	Separation of Isotopes in Calutron Units	H. Wesley Savage	S/U	Published 1951 (USAEC). Report TID-5233.
I-8	Problems of Physics in the Ion Source	Arthur H. Barnes S.M. MacNeille Chauncey Starr	S/U	Published 1951 (USAEC). Report TID-5219.
I-9	High-Voltage Problems	J.D. Trimmer Harry Pearlman	S/U	Published 1951 (USAEC). Report TID-5211.
I-10	Electrical Equipment for Tanks and Magnets	C.R. Baldock E.D. Hudson	S/U	Published 1952 (USEAC). Report TID-5214.
I-11	Vacuum Problems and Techniques	C.E. Normand Frank A. Knox G.W. Monk Alan J. Samuel W.R. Perret	S/U	Published 1950 (USEAC). Report TID-5210.

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Volume	Title	Authors	Classification Initial/Current	Comments
II-16- Appx. C	Appendix C. Absorption of Fluorine and Uranium Hexafluoride by Sodium Carbonate Solutions	G.G. Joris C.D. Compton	S/U	Published 1949 (USAEC). Additional appendix to NNES-II-16. No evidence that Appendices A or B exist.
DIVISION III - SPECIAL SEPARATION PROJECTS				
Editor: George M. Murrinhv				
III-1	Applied to the Large-Scale Production of U ₂₃₅	(b)(2)High	U	Published 1951 (McGraw-Hill). This volume is an unclassified abridged version of NNES-III-1A.
III-2	Spectroscopic Properties of Uranium Compounds	G.H. Dieke A.B.F. Duncan	U	Published 1949 (McGraw-Hill).
III-3	Chemical Separation of the Uranium Isotopes	Clyde A. Hutchinson, Jr.	S/U	Published 1952 (USAEC). Report TID-5224.
III-4A	Physical Properties and Analysis of Heavy Water	Isidor Kirshenbaum	U	Published 1951 (McGraw-Hill).
III-4B	Utilization of Heavy Water	Isidor Kirshenbaum	S/U	Published 1951 (USAEC). Report TID-5226.
III-4C	Bibliography of Research on Heavy Hydrogen Compounds	Alice H. Kimball	U	Published 1949 (McGraw-Hill).
III-4D	Laboratory Studies for Separation Processes	Maxwell L. Eidinoff George G. Joris Ellison H. Taylor Hugh S. Taylor Harold C. Urey	S/U	Published 1951 (USAEC). Report AECD-4238.
III-4E	Commercial Production of Heavy Water	James. O. Maloney Harold S. Ray	S/U	Published 1951 (USAEC).
III-4F	Production of Heavy Water	George M. Murphy Harold C. Urey Isidor Kirshenbaum	U	Published 1955 (McGraw-Hill).

Volume	Title	Authors	Classification Initial/Current	Comments
III-5	Separation of the Boron Isotopes	George M. Murphy	S/U	Published 1952 (USAEC). Report TID-5227.
III-6	Special Separations at the National Bureau of Standards	George M. Murphy Samuel L. Madorsky	S/U	Published 1952 (USAEC).
DIVISION IV - PLUTONIUM PROJECT RECORD				
Editors, Robert S. Mulliken and Hoylande D. Young				
IV-1	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-2A	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-2B	General Nuclear Physics: Collected Papers	G. S. Goldhaber	U (planned)	Proposed volume. Per note in copy of TID-373 held by DOE historian (Germantown), this volume was not published. Gertrude Scharff Goldhaber was affiliated with Brookhaven National Laboratory.
IV-3A	Neutron Diffusion and Pile Theory: File Physics and Design	A. M. Weinberg	S (planned)	Proposed volume; no evidence that it was written or published. Alvin Martin Weinberg was affiliated with Univ. of Chicago.
IV-3B	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-4	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-7	N/A	N/A	N/A	No evidence that this volume was ever proposed.

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Volume	Title	Authors	Classification Initial/Current	Comments
IV-14B	The Transuranium Elements: Research papers	Glenn T. Seaborg Joseph J. Katz Winston M. Manning	U	Published 1949 as two books (McGraw-Hill).
IV-15A	The Bismuth Phosphate Separation Process: Survey Volume	I. Perlman	S (planned)	Proposed volume; no evidence that it was written or published.
IV-15B	The Bismuth Phosphate Separation Process: Collected Papers	I. Perlman	S (planned)	Proposed volume; no evidence that it was written or published.
IV-16A	Alternate Processes for the Separation of Plutonium	Harrison S. Brown Winston M. Manning	S (planned)	Proposed volume; no evidence that it was written or published.
IV-16B	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-17A	Production and Separation of U ²³³ : Survey	Glenn T. Seaborg Leonard I. Katz	S/U	Published 1951 (USAEC). Report TID-5222.
IV-17B	Production and Separation of U ²³³ : Collected Papers	Leonard I. Katz	S/U	Published 1952 as two books (USAEC). Report TID-5223.
IV-18A	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-18B	Refractories: Collected Papers	J.C. Warner Leo Brewer	U (planned)	Proposed volume; no evidence that it was written or published.
IV-19A	N/A	N/A	N/A	No evidence that this volume was ever proposed.
IV-19B	The Chemistry and Metallurgy of Miscellaneous Materials: Thermodynamics	Lawrence L. Quill	U	Published 1950 (McGraw-Hill).
IV-19B-Revision	The Chemistry and Metallurgy of Miscellaneous Materials: Thermodynamics, Revision.	Leo Brewer	U	Report UCRL-2854 (11/1955) "Heats of Sublimation of the Elements."
IV-19C	The Chemistry and Metallurgy of Miscellaneous Materials	Lawrence L. Quill	U	Published 1955 (McGraw-Hill). Report TID-5212.

Volume	Title	Authors	Classification Initial/Current	Comments
IV-20	Industrial Medicine of the Plutonium Project: Survey and Collected Papers	Robert S. Stone	U	Published 1951 (McGraw-Hill).
IV-21A	N/A	N/A	N/A	Per preface in NNES-IV-20, NNES-IV-22B, and NNES-IV-23, this volume was abandoned.
IV-21B	N/A	N/A	N/A	Per preface in NNES-IV-20, NNES-IV-22B, and NNES-IV-23, this volume was abandoned.
IV-22A	N/A	N/A	N/A	Per preface in NNES-IV-20, NNES-IV-22B, and NNES-IV-23, this volume was abandoned.
IV-22B	Biological Effects of External X and Gamma Radiation: Part I	Raymond E. Zirkle	U	Published 1954 (McGraw-Hill).
IV-22C	Biological Effects of External X and Gamma Radiation: Part II	Raymond E. Zirkle	U	Published 1956 (McGraw-Hill). Report TID-5220.
IV-22D	Biological Effects of Fast and Slow Neutrons	Raymond E. Zirkle Marjory Lawson	U (planned)	Proposed volume. Per note in copy of TID-373 held by DOE historian (Germantown), this volume was not published, but intended TOC information exists.
IV-22E	Biological Effects of External Beta Radiation	Raymond E. Zirkle	U	Published 1951 (McGraw-Hill).
IV-22F	Metabolism and Biological Effects of Internal Emitters	Raymond E. Zirkle Marjory Lawson	U (planned)	Proposed volume. Per note in copy of TID-373 held by DOE historian (Germantown), this volume was not published, but intended TOC information exists.
IV-22G	Metabolism and Biological Effects of Internal Emitters	Raymond E. Zirkle Marjory Lawson	U (planned)	Proposed volume. Per note in copy of TID-373 held by DOE historian (Germantown), this volume was not published, but intended TOC information exists.

Volume	Title	Authors	Classification Initial/Current	Comments
IV-22H	Metabolism and Biological Effects of Internal Emitters	Raymond E. Zirkle Marjory Lawson	U (planned)	Proposed volume. Per note in copy of TID-373 held by DOE historian (Germantown), this volume was not published, but intended TOC information exists.
IV-22I	Histopathology of Irradiation from External and Internal Sources	William Bloom	U	Published 1948 (McGraw-Hill).
IV-23	Toxicology of Uranium: Survey and Collected Papers	A. Tannenbaum	U	Published 1951 (McGraw-Hill).
DIVISION V - LOS ALAMOS PROJECT				
Editors, Robert R. Davis and Ralph Carlisle Smith				
V-1	Electronics: Experimental Techniques	William C. Elmore Matthew Sands	U	Published 1949 (McGraw-Hill). Also published as Los Alamos Technical Series, Vol. 1, Part 1.
V-2	Ionization Chambers and Counters: Experimental Techniques	Bruno B. Rossi Hans H. Staub	U	Published 1949 (McGraw-Hill). Also published as Los Alamos Technical Series, Vol. 1, Part 2.
V-3	Miscellaneous Physical and Chemical Techniques of the Los Alamos Project	Alvin C. Graves Darol K. Froman	U	Published 1952 (McGraw-Hill). Also published as Los Alamos Technical Series, Vol. 1, Part 3.
V-4	Introduction to the Theory of Neutron Diffusion	Kenneth M. Case Frederic de Hoffmann George Placzek	U	Published 1953 (LASL), but not identified as part of NNES. Also published as Los Alamos Technical Series, Vol. 4. Also published as Report LAMD-1273.
DIVISION V - THE LOS ALAMOS TECHNICAL SERIES				
LATS-1	Experimental Techniques	Darol K. Froman	U	Internal report 1949, 1952 (LASL). Also published as NNES-V-1, NNES-V-2, and NNES-V-3.

Volume	Title	Authors	Classification Initial/Current	Comments
LATS-4	Introduction to the Theory of Neutron Diffusion	George Placzek	U	Internal report 1953 (LASL). See also NNES-V-4.

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DIVISION VI - UNIVERSITY OF ROCHESTER PROJECT
Editors, Donald D. Charles and Andrew H. Dowdy

VI-1	Pharmacology and Toxicology of Uranium Compounds	Carl Voegtlin Harold C. Hodge	U	Published 1949 (books 1 & 2) and 1953 (books 3 & 4) (McGraw-Hill).
VI-2	Biological Effects of External Radiation	H.A. Blair	U	Published 1954 (McGraw-Hill).
VI-3	Biological Studies with Polonium, Radium, and Plutonium	Robert M. Fink	U	Published 1950 (McGraw-Hill).

DIVISION VII - MATERIALS PROCUREMENT PROJECT
Editor, Charles Slesser

VII-1	Preparation, Properties, and Technology of Fluorine and Organo Fluoro Compounds	Charles Slesser	U	Published 1951 (McGraw-Hill).
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Volume	Title	Authors	Classification Initial/Current	Comments
VIII-5	The Chemistry of Uranium. Part I. The Element, Its Binary and Related Compounds	Joseph J. Katz Eugene Rabinowitch	U	Published 1951 (McGraw-Hill).
VIII-6	Chemistry of Uranium	Joseph J. Katz Eugene Rabinowitch	U (planned)	We suspect that this was intended to be The Chemistry of Uranium. Part II, but there is no evidence that this volume was written.
VIII-6- paper A7	The System Uranium-Nitrogen			Internal report 1946 (USAEC). Pergamon ad lists this as a distinct part of NNES, but it is actually NNES-VIII-7-paper 6.
VIII-7	Chemistry of Uranium: Collected Papers	Joseph J. Katz Eugene Rabinowitch	U	Published 1958 as two books (USAEC). Based on titles listed in TID-373, we conclude that this report was intended to be NNES-VIII-7, Report TID-5290.
VIII-8	Medical Effects of the Atomic Bomb in Japan	Ashley W. Oughterson Shields Warren	U	Published 1956 (McGraw-Hill).
DIVISION IX - THERMAL DIFFUSION PROJECT				
IX-1	Liquid Thermal Diffusion	Philip H. Abelson Nathan Rosen John I. Hoover	S/U	Published 1951 (USAEC). Report TID-5229.
DIVISION X - CENTRIFUGE PROJECT				
X-1	Developments in the Centrifuge Separation Project	J.W. Beams A.C. Hagg E.V. Murphree	S/U	Published 1951 (USAEC). Report TID-5230.



APPENDIX F: NNES Tables of Contents

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VACUUM EQUIPMENT AND TECHNIQUES

Edited by A. Guthrie and R. K. Wakerling

Published 1949

McGraw-Hill Book Company, Inc., New York

264 pages plus xvii pages

Chapter 6 published 4/1952 - Secret, declassified 4/1956

33 pages

Chapter		Report No.
1	Fundamental Considerations in Vacuum Practice by R. Loevinger	AECD-1946 (BP-43)
2	Elements of the Vacuum System by W. E. Bush	AECD-2084 (BP-33)
3	Vacuum Gauges by K. M. Simpson	AECD-2186 (BP-34)
4	Vacuum Materials and Equipment by W. E. Bush	AECD-2206 (BP-68)
5	Leak-detection Instruments and Techniques by R. Loevinger and A. Guthrie	AECD-2405 (BP-93)
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6	Operational Techniques	BP-45

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MAGNETS AND MAGNETIC MEASURING TECHNIQUES

Edited by A. Guthrie and R. K. Wakerling

Report Number: TID-5215

Published 1949 - Secret, declassified 4/1955

USAEC Technical Information Service, Oak Ridge

231 pages

Chapter		Report No.
1	Some Basic Considerations Regarding Magnet Design Requirements by Wilson M. Powell and Eneas Kane	BP-51
2	Magnetic Measuring Instruments and Techniques by John DePhanger, R. K. Wakerling, and A. Guthrie	UCRL-24
3	Model Magnets and Their Performance by R. K. Wakerling	BP-108
4	Magnetic Tests on Full-scale Magnets by R. K. Wakerling and A. Guthrie	BP-126
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ELECTRICAL CIRCUITS FOR CALUTRONS

Edited by R. K. Wakerling and A. Guthrie

Report Number: TID-5216

Published 1949 - Secret, declassified 4/1955

USAEC Technical Information Service, Oak Ridge

300 pages

Chapter		Report No.
1	General Theory of Regulator Systems by Burton F. Miller	UCRL-72
2	High-voltage Regulators by K. MacKenzie	UCRL-76
3	Arc Regulation and Temperature Control by R. deLiban	UCRL-170
4	Magnet Regulators by K. MacLeish	UCRL-225
5	Miscellaneous Electrical Circuits by A. Guthrie	UCRL-323
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ELECTROMAGNETIC SEPARATION OF ISOTOPES IN COMMERCIAL
QUANTITIES

Edited by R. K. Wakerling and A. Guthrie

Report Number: TID-5217

Published 1951 - Secret, declassified 5/1955

USAEC Technical Information Service, Oak Ridge

456 pages

Chapter		Report No.
	Introduction by W. E. Parkins	UCRL-838
Part I - The Calutron		
1	Basic Considerations in the Calutron Process by E. Gardner and A. Guthrie	UCRL-825
2	Space-charge Neutralization and Studies of the Beam Plasma by B. Peters, A. C. Helmholz, and W. E. Parkins	UCRL-826
3	Magnetic Linear Shims for Beam Focusing by R. K. Wakerling	UCRL-827
4	Other Magnetic Shimming Devices by R. K. Wakerling	UCRL-828
5	Performance of Magnetic shims and Focal Studies by H. F. Weaver and R. K. Wakerling	UCRL-829
6	Electric Focusing Devices by B. Peters	UCRL-830
7	Focusing Action of Accelerating Electrodes by R. K. Wakerling and A. C. Helmholz	UCRL-831
8	The Alpha 3 and 4 Programs by W. E. Parkins	UCRL-832
Part II - The Isotron		
9	The Isotron by R. R. Wilson	UCRL-833
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10	The Ionic Centrifuge by J. Slepian	UCRL-834
11	The Radial Magnetic Separator by E. Gardner	UCRL-835
12	The Resonance Method by J. R. Richardson	UCRL-836
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THE CHARACTERISTICS OF ELECTRICAL DISCHARGES IN MAGNETIC
FIELDS

Edited by A. Guthrie and R. K. Wakerling

Published 1949

McGraw-Hill Book Company, Inc., New York

376 pages plus xviii pages

Chapter		Report No.
1	Qualitative Description of the Arc Plasma in a Magnetic Field by D. Bohm	MDDC-597 (BP-38)
2	The Use of Probes for Plasma Exploration in Strong Magnetic Fields by D. Bohm, E. H. S. Burhop, and H. S. W. Massey	AECD-2230 (BP-46)
3	Minimum Ionic Kinetic Energy for a Stable Sheath by D. Bohm	MDDC-537 (BP-32)
4	Theoretical Considerations Regarding Minimum Pressure for Stable Arc Operations by D. Bohm	MDDC-681 (BP-47)
5	Experimental Investigation of Threshold Pressure for Stable Operation of Arcs by E. H. S. Burhop, H. S. W. Massey, and G. Page	MDDC-636 (BP-30)
6	Measurements of the Absolute Values of the Cross Sections for Ionization of Uranium Tetrachloride and Uranium Hexafluoride by Electrons by W. E. Berkey, E. H. S. Burhop, J. D. Craggs, J. Keene, and H. S. W. Massey	MDDC-564 (BP-26)
7	The Ionization and Dissociation of Uranium Tetrachloride and Uranium Hexafluoride by Electron Impact by E. H. S. Burhop, H. S. W. Massey, and C. Watt	MDDC-1529 (BP-37)
8	The Rate of Ion Production by an Electron Beam by T. L. Hill and L. H. Aller	MDDC-425
9	A Study of the Arc Plasma by D. Bohm, E. H. S. Burhop, H. S. W. Massey, and R. W. Williams	AECD-2094 (BP-39)
10	Discharge Cathodes by W. E. Parkins	MDDC-650 (BP-35)
11	Theory and Operation of a Philips Ionization Gauge Type Discharge by J. Backus	MDDC-1327 (BP-27)
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SEPARATION OF ISOTOPES IN CALUTRON UNITS

Edited by H. Wesley Savage

Report Number: TID-5233

Published 1951 - Secret, declassified 2/1960

USAEC Technical Information Service, Oak Ridge

437 pages

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Report No.

Part I - Introduction
Edited by H. W. Savage

- 1 Electromagnetic Process Plant
by H. W. Savage
- 2 Electromagnetic Plant Specifications
by H. W. Savage
- 3 Production Equipment and Development at CEW-TEC
by A. J. Miller and H. W. Savage

This volume
is made up of
Report H-1.740.1

Part II - Ion Source
Edited by J. S. Hood

- 4 Development of the Beta Ion Source
by John Harding, R. S. Livingston, and E. G. Struxness
- 5 Performance of the Beta Ion Source
by R. S. Livingston, J. E. Rogers, J. Rolland, and E. G. Struxness
- 6 Beta Experimental Sources
by J. Harding, R. S. Livingston, Fred Pressey, and E. G. Struxness
- 7 Alpha I Ion Sources
by J. S. Culver and M. A. Richtmyer
- 8 Alpha II Ion Sources
by F. F. Calloway and P. E. Wilkinson

Part III - Ion Receivers

- 9 Introduction to Ion Receivers
by B. Harmatz and K. Korn
- 10 Alpha I Receivers
by K. Korn and B. L. Moore
- 11 Alpha II Receivers
by C. R. Baldock
- 12 Development of Beta Production Receivers
by R. S. Livingston, B. L. Moore and I. E. Slawson
- 13 Scraper-type Receivers
by R. S. Livingston and B. L. Moore
- 14 Deceleration-type Receivers
by B. L. Moore
- 15 The Receiver Mechanism
by W. O. Brunk and K. Korn

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- 18 Chemistry Related to the Separation of Stable Isotopes
by A. J. Miller and B. S. Weaver
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PROBLEMS OF PHYSICS IN THE ION SOURCE

By Arthur H. Barnes, S. M. MacNeille, and Chauncey Starr
Edited by H. Wesley Savage

Report Number: TID-5219
Published 1951 - Secret, declassified 5/1955
USAEC Technical Information Service, Oak Ridge
294 pages plus viii pages

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1	Introduction	This volume is made up of Report H-1.740.2
2	Cathodes and Defining Slots	
3	Production-improvement Studies	
4	Accelerating System and Ion Beams	
	<i>Part II - Vapor Production and Control</i>	
5	Vapor Production	
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10	External Feed Systems	
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HIGH-VOLTAGE PROBLEMS

By J. D. Trimmer and Harry Pearlman
Edited by H. Wesley Savage

Report Number: TID-5211
Published 1951 - Secret, declassified 1/1954
USAEC Technical Information Service, Oak Ridge
246 pages

Chapter		Report No.
	<i>Part I - High-Voltage Sparking</i>	
1	Original Equipment in Relation to Sparking	This volume is made up of Report H-1.740.3
2	Extent and Nature of Sparking	
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4	High-voltage Cables and Cable Terminations	
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7	Conditions of Calutron Insulator Operation	
8	Calutron Insulators in the Plant	
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10	Research on Factors Affecting Insulator Performance	
11	General Considerations	
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ELECTRICAL EQUIPMENT FOR TANKS AND MAGNETS

Edited by C. R. Baldock and E. D. Hudson

Report Number: TID-5214

Published 1952 - Secret, declassified 6/1955

USAEC Technical Information Service, Oak Ridge

425 pages

Chapter		Report No.
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1	General Description of High-voltage Supplies	This volume is made up of Report H-1.740.4
2	Physical Descriptions and Ratings of High-voltage Supplies	
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4	Equipment Ratings and Operating Requirements	
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VACUUM PROBLEMS AND TECHNIQUES

By C. E. Normand, Frank A. Knox, G. W. Monk, Alan J. Samuel, and
W. R. Perret

Report Number: TID-5210

Published 1950 - Secret, declassified 6/1954

USAEC Technical Information Service, Oak Ridge

265 pages plus v pages

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1	Production-plant Vacuum Systems by C. E. Normand	This volume is made up of Report H-1.740.5
2	Materials Used in Vacuum Systems by C. E. Normand	
3	Cold Traps and Refrigerants by C. E. Normand and Frank A. Knox	
4	Vacuum-system Instrumentation by W. R. Perret and G. W. Monk	
5	Vacuum Testing and Leak Detection by G. W. Monk and C. E. Normand	
6	Pump-down and Outgassing by C. E. Normand and Alan J. Samuel	
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PROCESS

Edited by G. A. Akin, H. P. Kackenmaster, R. J. Schraeder,
J. W. Strohecker, and R. E. Tate

Report Number: TID-5232

Published 1951 - Secret, declassified 2/1960

USAEC Technical Information Service, Oak Ridge

506 pages

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1	A Description of the Plant for Producing U-235 by the Electromagnetic Process by G. A. Akin
2	The Chemical and Recovery Phases of the Alpha Plant Operations by J. L. Patterson
3	The Recovery of Uranium from Alpha Calutron Wash by R. J. Schmidt
4	The Liquid-phase Chlorination of Uranium Trioxide to Uranium Tetrachloride for the Alpha Electromagnetic Separation Process by F. M. Tench, Jr.
5	The Vapor-phase Chlorination of Uranium Trioxide by F. M. Tench, Jr.
6	Description of Building 9207 Area for Handling Enriched Feed by R. J. Schrader
7	Recovery of Uranium Trioxide from Alpha Gunk Solution and Various Contaminated Materials in Building 9207 by A. DeHaan, Jr. and R. J. Schrader
8	The Preparation of Uranium Tetrachloride from Uranium Trioxide in Building 9207 by H. I. Bernstein and R. J. Schrader
9	The Vacuum-sublimation Process in Building 9210 by J. W. Strohecker
10	Processing of Combustible Salvage Materials in Building 9769 by W. B. Webster and R. J. Schrader
11	Interlocks in the 9207 Area by J. W. Strohecker
12	Control and Neutralization of Phosgene by R. J. Schrader
13	A Description of the Beta Chemical Operations in the Electro- magnetic Separation Plant by H. R. Brigham
14	The Chemical Operations of Cleaning and Recovery in the Beta Recovery Department by T. H. Little

Report No.
This volume
is made up of
Report H-1.740.6

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16	Application of Peroxide Precipitation for the Purification and Recovery of Uranium in the Beta Electromagnetic Separation Plant by J. S. Reece	
17	Concentration Equipment in the Beta Recovery Department by G. Malinoff	
18	Losses in Beta Recycle in the Beta Recovery Department by W. Tames	
19	Conversion of Uranium Hexafluoride to Uranium Trioxide by F. N. Case	
20	Extraction of Uranium from Solutions Containing Various Metallic Impurities by G. A. Akin	
21	Precipitation of Uranium Peroxide from Concentrated Solutions by H. R. Brigham	
22	UCl ₄ Preparation by J. W. Zuidema	
23	Recovery of Uranium from Alpha Collector Pockets by P. B. Petretzky	
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25	Recovery of Uranium from Combustible Materials by Ignition by D. H. White	
26	Recovery of Uranium from Carbon Collectors in the Beta Electromagnetic Separation Plant by G. A. Akin	
27	Chemical Operations on the Final Product of the Electromagnetic Process for the Preparation of Uranium 235 by A. B. Townsend	
28	Preparation of Uranium Tetrafluoride from Uranium Peroxide by A. B. Townsend	
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30	Losses on Uniforms and Shoes in Cleaning Calutron Units by J. Ginsberg	
31	Recovery of Uranium from Metallic Tantalum by H. R. Brigham	
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by T. A. Rich (General Electric Company)
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by O. W. Livingston (General Electric Company)
- VI Procurement, Inspection, and Expediting of Equipment and
Materials
by W. M. Driscoll, T. J. Forde, J. P. Piper, and
G. P. Darlington

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STONE AND WEBSTER ENGINEERING CORPORATION CONTRIBUTION TO
THE ELECTROMAGNETIC SEPARATION PROJECT, PART II. GENERAL
ENGINEERING DEVELOPMENT

Chief Editor: B. W. Whitehurst

Edited by: R. E. Argersinger, C. T. Chave, J. O'R. Coleman, R. L. Geddes,
and G. R. Strandberg

Unpublished Draft 10/14/1946 - Secret, declassified (unknown date)
USAEC Technical Information Service, Oak Ridge

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by W. L. Sheets
4. Shops and Unusual Shop Duties
by W. L. Sheets and B. W. Whitehurst
5. Atomic Bomb Engineering
by A. C. Klein
6. Miles of Glass Piping
by B. W. Whitehurst

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STONE AND WEBSTER ENGINEERING CORPORATION CONTRIBUTION TO
THE ELECTROMAGNETIC SEPARATION PROJECT, PART II.
CHEMICAL ENGINEERING

Chief Editor: B. W. Whitehurst
Edited by: R. E. Argersinger, C. T. Chave, J. O'R. Coleman, R. L. Geddes,
and G. R. Strandberg

Unpublished Draft 10/14/1946 - Secret, declassified (unknown date)
USAEC Technical Information Service, Oak Ridge
502 pages

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by H. J. White (Research Corp.)

Report No.

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ISOTOPIC ANALYSIS

Edited by George M. Murphy and A. M. Wald

Published 1951 - Secret, declassified 8/1991
USAEC Technical Information Service, Oak Ridge
412 pages

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2	Apparatus by M. G. Inghram and O. H. Nestor	
3	Operational Characteristics by J. G. Heacock, M. G. Inghram, and O. H. Nestor	
4	Mass-spectrometer Operation by M. G. Inghram, O. H. Nestor, R. J. Omohundro, and G. Reed, Jr.	
5	Absolute Measurements by M. G. Inghram and B. M. Rustad	
6	Mass-spectrometer Maintenance by J. P. Chastagner, Jr., O. H. Nestor, D. Schuman, and J. L. Curlin	
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8	Theory of the Counting Methods by B. Carroll	
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11	Film-fission Counter by Harold G. Beyer	
12	Counting Systems for Isotopic Analysis by H. D. Goldberg and M. I. Goldberg	
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14	Some Recent Developments in Counting Methods of Isotopic Analysis, Including Isotopic Standards and Determinations of Isotopic Content of Unaltered Uranium Edited by A. B. Meservey	K-115
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ENGINEERING DEVELOPMENTS IN THE GASEOUS DIFFUSION PROCESS

Edited by Manson Benedict and Clarke Williams

Published 1949

McGraw-Hill Book Company, Inc., New York

129 pages plus xx pages

Appendix C published 1946 - Secret, declassified 1/1956

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THE THEORY OF ISOTOPE SEPARATION AS APPLIED TO THE LARGE-
SCALE PRODUCTION OF U²³⁵

By Karl P. Cohen

Edited by George M. Murphy

Main Report Number: MDDC-1138

Published 1951

McGraw-Hill Book Company, Inc., New York

165 pages plus xviii pages

Chapter		Report No.
1	Ideal Cascades	This volume is made up of Report MDDC-1138
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3	Equilibrium Time of a Square Cascade	
4	Determination of Cascade Constants	
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SPECTROSCOPIC PROPERTIES OF URANIUM COMPOUNDS

By G. H. Dieke and A. B. F. Duncan

Main Report Number: MDDC-688

Published 1949

McGraw-Hill Book Company, Inc., New York

290 pages plus xviii pages

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2	X-ray Analysis of the Crystal Structure of Uranyl Compounds	
3	General Features of the Fluorescence and Absorption Spectra of Uranyl Compounds	
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CHEMICAL SEPARATION OF THE URANIUM ISOTOPES

By Clyde A. Hutchinson, Jr.
Edited By George M. Murphy

Report Number: TID-5224
Published 1952 - Secret, declassified 3/1960
USAEC Technical Information Service, Oak Ridge
193 pages plus v pages

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1	Theory and General Discussion of the Chemical Separation of Isotopes
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PHYSICAL PROPERTIES AND ANALYSIS OF HEAVY WATER

By Isidor Kirshenbaum
Edited by Harold C. Urey and George M. Murphy

Published 1951
McGraw-Hill Book Company, Inc., New York
438 pages plus xv pages

Addendum Published 5/25/1951 - Secret, declassified, 3/1957
Report Number: TID-5028

Chapter		Report No.
1	Physical Properties	
2	Equilibrium Constants for Exchange Reactions	
3	Isotopic Analysis by the Mass Spectrometer	
4	Isotopic Analysis of Heavy Water by the Mass Spectrometer	
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UTILIZATION OF HEAVY WATER

By Isidor Kirshenbaum

Edited by George M. Murphy and Harold C. Urey

Report Number: TID-5226

Published 1951 - Secret, declassified 4/1957

USAEC Technical Information Service, Oak Ridge

208 pages

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- 1 Introduction and Theory
 - 2 Properties of the Uranium Oxides
 - 3 Physical Properties of Slurries
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BIBLIOGRAPHY OF RESEARCH ON HEAVY HYDROGEN COMPOUNDS

Compiled by Alice H. Kimball

Edited by Harold C. Urey and Isidor Kirshenbaum

Main Report Number: AECD-1975

Published 1949

McGraw-Hill Book Company, Inc., New York

350 pages plus xv pages

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Report No.
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AECD-1975

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LABORATORY STUDIES FOR SEPARATION PROCESSES

By Maxwell L. Eidinoff, George G. Joris, Ellison H. Taylor, Hugh S. Taylor,
and Harold S. Urey

Edited by George M. Murphy, Harold C. Urey, and Isidor Kirshenbaum

Report Number: AECD-4238

Published 1951 - Secret, declassified 4/1957

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406 pages

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7	Dual-Temperature Process - Sulfide System by Maxwell L. Eidinoff	
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NNES - III - 4F

PRODUCTION OF HEAVY WATER

Edited by George M. Murphy, Harold C. Urey, and Isidor Kirshenbaum

Published 1955

McGraw-Hill Book Company, Inc., New York

394 pages plus xvii pages

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Edited by George M. Murphy and Samuel L. Madorsky

Published 1952 - Secret, declassified w/deletions (1951)
 USAEC Technical Information Service, Oak Ridge
 340 pages

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Edited by George S. Monk and W. H. McCorkle

Published 1954

McGraw-Hill Book Company, Inc., New York

262 pages plus xxv pages

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2.5	The Corner Periscope by George S. Monk, W. H. McCorkle, and Associates	CP-G-2437
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Edited by Charles D. Coryell and Nathan Sugarman

Published as 3 Books

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2086 plus xv pages.

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Book 2 (1952) - pages 517-1315 plus xvi pages

Book 3 (1953) - pages 1316-2086 plus xix pages

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3	An Analysis of the Effects on Absorption Curves of Scattering of β Radiation by Absorbers by T. B. Novey and N. Elliott	AECD-2559-C
4	Investigation of the Effects on β Counting of Self-Scattering Due to Source Weight by D. W. Engelkemeir, J. A. Sciler, E. P. Steinberg, and L. Winsberg	AECD-2559-D
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THE ACTINIDE ELEMENTS

Edited by Glenn T. Seaborg and Joseph J. Katz

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3	Nuclear Properties of Uranium, Protactinium and Thorium Isotopes by Leonard I. Katzin	
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THE TRANSURANIUM ELEMENTS: RESEARCH PAPERS

Edited by Glenn T. Seaborg, Joseph J. Katz, and Winston M. Manning

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PRODUCTION AND SEPARATION OF U²³³: SURVEY

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PRODUCTION AND SEPARATION OF U²³³: COLLECTED PAPERS

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Book 2-pages 411-728 plus v pages

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THE CHEMISTRY AND METALLURGY OF MISCELLANEOUS MATERIALS:
THERMODYNAMICS

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ELEMENTS, Report Number: UCRL-2854, 11/1955

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INDUSTRIAL MEDICINE OF THE PLUTONIUM PROJECT: SURVEY AND
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15	Effects of Total-body X Irradiation on Rats. II. Effects of Small Daily Exposures on Growth by George A. Sacher	CH-3902
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BIOLOGICAL EFFECTS OF EXTERNAL BETA RADIATION

Edited by Raymond E. Zirkle

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METABOLISM AND BIOLOGICAL EFFECTS OF INTERNAL EMITTERS

Edited by Raymond E. Zirkle and Marjory Lawson

Based on handwritten notes in the copy of TID-373 held by the DOE Historian in Germantown, this volume was never published. Information intended for this volume is listed in the table of contents below.

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3	The Quantitative Estimation of the Activity of Beta-particle Emitters by A. Broido, J. Teresi, and P. C. Tompkins	MDDC-598
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Edited by Raymond E. Zirkle and M. Lawson

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HISTOPATHOLOGY OF IRRADIATION FROM EXTERNAL AND INTERNAL SOURCES

Edited by William Bloom

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808 pages plus xxv pages

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2	Materials and Methods by Raymond G. Murray, Ella Tyree, Marjorie Ismond, and George Svihla	
3	The Cell by William Bloom	
4	The Skin by Ray S. Snider	
5	Bone by Minnie Heller	
6	Bone Marrow by Margaret A. Bloom	
7	The Spleen by Raymond G. Murray	
8	Lymph Node and Intestinal Lymphatic Tissue by Peter Paul Henry De Bruyn	
9	The Thymus by Raymond G. Murray	
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15	The Lung by Ruth Pinkney Rhoades	
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Edited by Albert Tannenbaum

Published 1951

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333 pages plus xxvi pages

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Edited by William C. Elmore and Matthew Sands

Published 1949

McGraw-Hill Book Company, Inc., New York
417 pages plus xviii pages

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Edited by Bruno B. Rossi and Hans H. Staub

Published 1949

McGraw-Hill Book Company, Inc., New York

243 pages plus xviii pages

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Edited by Alvin C. Graves and Darol K. Froman

Published 1952

McGraw-Hill Book Company, Inc., New York

323 pages plus xiii pages

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INTRODUCTION TO THE THEORY OF NEUTRON DIFFUSION
(Los Alamos Technical Series - Volume IV)

Edited by K. M. Case, F. de Hoffmann, and G. Placzek

Published 1953
Los Alamos Scientific Laboratory, Los Alamos, NM
174 pages plus viii pages

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2	Continuity Equation	
3	Source-Free Streaming	
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19	Biochemical Methods by Nathan Glover, Frank A. Smith, Walter Marin, and Luville T. Steadman	
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21	Toxicity Following Inhalation for 1 and 2 Years by H. E. Stokinger, R. C. Baxter, H. P. Dygert, C. W. LaBelle, S. Laskin, U. C. Pozzani, E. Roberts, J. J. Rothermel, A. Rothstein, C. J. Spiegl, G. F. Sprague III, H. B. Wilson, and R. G. Yaeger	
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27	Biological Effects of Uranium: Literature Review by Ann G. Dinse and Leo J. LaFrance	
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NNES - VI - 3

BIOLOGICAL STUDIES WITH POLONIUM, RADIUM, AND PLUTONIUM

Edited by Robert M. Fink

Published 1950

McGraw-Hill Book Company, Inc., New York

411 pages plus xvi pages

Chapter		Report No.
	<i>Part I - Distribution and Excretion of Polonium</i>	
	Introduction by H. E. Silberstein	AECD-2591
1	General Methods Used in Polonium Distribution and Excretion Experiments by A. T. Gorham, Robert M. Fink, C. P. Kimball, W. L. Minto, H. E. Silberstein, E. K. Vittum, W. F. Bale, T. Enns, and E. L. Alling	AECD-2591
2	Polonium Distribution and Excretion Experiments with Animals by H. E. Silberstein, W. L. Minto, Robert M. Fink, G. A. Boyd, R. G. Metcalf, W. Mann, C. P. Kimball, and A. T. Gorham	AECD-2591
3	Studies of Polonium Metabolism in Human Subjects by H. E. Silberstein, W. N. Valentine, W. L. Minto, J. S. Lawrence, Robert M. Fink, and A. T. Gorham	AECD-2591
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4	Historical Background by H. E. Silberstein	AECD-2592
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7	Pilot Studies on the Intravenous Lethal Dosage of Polonium, Plutonium, and Radium in Rats by G. A. Boyd, H. E. Silberstein, Robert M. Fink, A. Frenkel, W. L. Minto, R. G. Metcalf, G. Casarett, and G. M. Suter	AECD-2593
8	Simultaneous Studies on the Intravenous Lethal Dosage of Polonium, Plutonium, and Radium in Rats by G. A. Boyd, A. Williams, W. L. Minto, D. V. Tiedeman, Robert M. Fink, G. Casarett, and R. G. Metcalf	AECD-2605
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PREPARATION, PROPERTIES, AND TECHNOLOGY OF FLUORINE AND
ORGANIC FLUORO COMPOUNDS

Edited by Charles Slesser; Associate Editor, Stuart R. Schram

Published 1951

McGraw-Hill Book Company, Inc., New York

868 pages plus xxiii pages

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1	Survey of the Problem by R. Rosen	AECD-2339
Part I - Generation of Fluorine		
2	Laboratory Studies of Electrolytic Fluorine Cells by W. C. Schumb	MDDC-328
3	A 1,500-amp Cell for Fluorine Generation by R. C. Downing	MDDC-552
4	Development of a 2,000-amp Fluorine Cell by R. L. Murray, S. G. Osborne, and K. E. Stuart	MDDC-172
5	Fluorine Production in a 1,000-amp Cell by K. E. Long, C. F. Swinehart, and G. C. Whitaker	MDDC-156
6	Development of High-temperature Fluorine Cells by W. B. Burford III, R. D. Fowler, H. C. Anderson, J. M. Hamilton, Jr., and C. E. Weber	MDDC-635
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10	Luting for Pipe Threads in Fluorine Lines by C. E. Weber, W. B. Burford III, and S. B. Bitterlich	MDDC-230
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Part IVB – Realization of Perfluorocarbons: Industrial Development

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30	Preparation of Perfluoro Solvents, Oils, and Waxes from Petroleum Fractions by Louis Spiegler	MDDC-1637
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36	Identification and Reactions of Polyhalohydrocarbons and Halocarbons Produced from <i>n</i> -Heptane by E. T. McBee, R. C. Schreyer, B. W. Hotten, W. S. Barnhart, K. W. Krantz, L. R. Evans, and Z. D. Welch	MDDC-162
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38	Reaction of Polyhalogenated Aromatic Compounds with Antimony Pentafluoride by E. T. McBee, J. S. Newcomer, W. E. Burt, and Z. D. Welch	MDDC-167
39	Effect of Hydrogen Content on Stability of Perfluoro Oils by C. E. Weber, W. B. Burford III, J. M. Hamilton, Jr., H. C. Anderson, M. B. Rogers, and I. Litant	
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URANIUM TECHNOLOGY: GENERAL SURVEY

By J. E. Vance and J. C. Warner
Edited by L. G. Bassett and A. M. Wald

Report Number: TID-5231
Published 1951 - Secret, declassified, 7/1960
USAEC Technical Information Service, Oak Ridge
238 pages

Chapter		Report No.
1	Extraction of Uranium from Domestic Uranium-ore Concentrates by J. E. Vance	
2	Extraction of Uranium from Pitchblende and Torbernite Ores by the Sulfuric Acid Process by J. E. Vance	
3	Preparation of Pure U_3O_8 from Crude U_3O_8 and from Sodium Diuranate by J. E. Vance	
4	Preparation of Pure UO_3 Directly from Pitchblende Ores by J. E. Vance	
5	Preparation of Pure Uranium Compounds from Pure Uranyl Nitrate Hexahydrate by J. E. Vance	
6	Early Methods for Producing Uranium Metal by J. C. Warner	
7	Methods for Production of Uranium Metal by J. C. Warner	
8	Large-scale Melting and Casting of Uranium Metal by J. C. Warner	
9	Recovery of Uranium from Residues and Scrap Materials by J. E. Vance	
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NNES - VII - 3

POLONIUM

Edited by Harvey V. Moyer

Report Number: TID-5221

Published 1956

USAEC Technical Information Service, Oak Ridge

392 pages plus x pages

POLONIUM, CHAPTER 14, THE PRODUCTION OF POLONIUM

by J. W. Wright and G. D. Nelson

Report Number: TID-5316

Published 1955 - Secret, declassified 1960

69 pages

Chapter		Report No.
1	Survey of Early Operations by Harvey V. Moyer	
2	Nuclear Properties of Polonium by James M. Goode	
3	Physical Properties of Polonium by James M. Goode	
4	Chemical Properties of Polonium by Harvey V. Moyer	
5	Biological Research Related to Polonium by Edward Spoerl and David S. Anthony	
6	Polonium from Lead Residues by Harvey V. Moyer	
7	Polonium from Irradiated Bismuth: Chemical Separation by Lloyd B. Gnagey, James M. Goode, G. D. Nelson, and J. W. Wright	
8	Polonium from Irradiated Bismuth: Studies on Separation by Distillation by P. M. Engle, R. W. Endebrock, and G. C. Cox	
9	Instrumentation by Warren L. Hood and Adrian J. Rogers	
10	Calorimetry by Adrian J. Rogers	
11	Waste Disposal by F. M. Huddleston, R. R. Deem, P. M. Hamilton, and F. C. Mead, Jr.	
12	Neutron Sources and Alpha Sources by John L. Richmond	
13	Health Physics by Warren L. Hood and John S. Stanton	

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14	Polonium. Chapter 14. The Production of Polonium by J. W. Wright and G. D. Nelson
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TID-5316

NNES - VIII - 1

ANALYTICAL CHEMISTRY OF THE MANHATTAN PROJECT

Edited by C. J. Rodden, N. H. Furman, E. H. Huffman, T. D. Price,
L. L. Quill and J. I. Watters

Published 1950
McGraw-Hill Book Company, Inc., New York
748 pages plus xx pages

Chapter 41
Published 4/1946 - Secret, declassified
23 pages

Chapter		Report No.
<i>Part I - Analytical Chemistry of Elements Studied on the Manhattan Project</i>		
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2	Thorium by C. J. Rodden and J. C. Warf	AECD-2701
3	Nitrogen by K. J. Jensen and R. J. Mundy	MDDC-572
4	Silicon by K. J. Jensen and C. J. Rodden	MDDC-1373
5	Fluorine and Fluorocarbons by G. W. Busch, R. C. Carter, F. E. McKenna, H. R. Priest, and E. Staple	AECD-2604
6	Carbon, Hydrogen, and Oxygen by C. J. Rodden	MDDC-581
7	Chlorine, Bromine, and Iodine by R. G. Mansfield and D. H. Templeton	AECD-2607
8	Sulfur, Selenium and Tellurium by F. E. McKenna and D. H. Templeton	MDDC-1379
9	Phosphorous, Arsenic, Antimony, and Bismuth by D. H. Templeton and L. G. Bassett	MDDC-1389
10	Sodium, Potassium, Rubidium, and Cesium by L. G. Bassett and W. Byerley	MDDC-1132
11	Beryllium, Magnesium, Calcium, Strontium, Barium, and Radium by L. W. Neidrach, A. M. Mitchell, and C. J. Rodden	AECD-2159
12	Germanium, Tin, and Lead by R. E. Telford and N. H. Furman	AECD-2612
13	Aluminum, Gallium, Indium, and Thallium by L. G. Bassett and F. S. Tomkins	AECD-2599
14	Zinc, Cadmium, and Mercury by N. H. Furman and K. J. Jensen	MDDC-755
15	Copper, Silver, and Gold by T. D. Price and R. E. Telford	MDDC-372

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NNES - VIII - 5

THE CHEMISTRY OF URANIUM. PART I. THE ELEMENT, ITS BINARY AND RELATED COMPOUNDS

By Joseph J. Katz and Eugene Rabinowitch

Published 1951

McGraw-Hill Book Company, Inc., New York
609 pages plus xxi pages

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2	Properties of the Uranium Atom	AECD-2624
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36	Heats of Reaction of the Aqueous Uranium Oxidation-Reduction Couples by B. J. Fontana	
37	Note on the Separation of Hydrogen Fluoride from Uranium Hexafluoride by Aristid V. Grosse	
38	A Method for Handling and Purifying UF_6 in Glass Vessels by Means of Alkali Fluoride Getters by Aristid V. Grosse	
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40	UF_5 , A New Fluoride of Uranium by Aristid V. Grosse	
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NNES - VIII - 8

MEDICAL EFFECTS OF THE ATOMIC BOMB IN JAPAN

Edited by Ashley W. Oughterson and Shields Warren

Published 1956

McGraw-Hill Book Company, Inc., New York

477 pages plus xvi pages

Chapter		Report No.
1	Summary	
2	Prelude to Medical Investigation	
3	Scope of Damage and the Effects on Medical Care and Facilities	
4	Number and Types of Casualties	
5	Clinical Observations in Hiroshima and Nagasaki	
6	Hematology of Atomic-bomb Injuries	
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NNES - IX - 1

LIQUID THERMAL DIFFUSION

Report Number: TID-5229

Edited by Philip H. Abelson, Nathan Rosen, and John I. Hoover

Published 1951 - Secret, declassified, 6/1957

USAEC Technical Information Service, Oak Ridge

176 pages plus 4 pages

Chapter

Report No.

Part I - General Theory and Project History

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| 1 | A Survey of the Literature Relevant to Liquid Thermal Diffusion |
| 2 | Early History of the Liquid Thermal Diffusion Project |

Part II - Theoretical Aspects

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| 3 | The Column |
| 4 | Approach to Equilibrium by a Single Column |
| 5 | Effect of Circulation |
| 6 | The Continuous Pyramid |
| 7 | Performance Criteria |
| 8 | Columns in a Pyramid |
| 9 | Design and Performance of Small Pyramids |
| 10 | Approximate Treatment of Small Pyramids Approaching Equilibrium |
| 11 | The Stripper Section |
| 12 | Nonuniform Columns in Parallel Operation |
| | Index |







Sandia National Laboratories

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June 4, 1999

Distribution:

Re: Transmittal of Report SAND99-1114, "The National Nuclear Energy Series: An Abridged Compilation"

Enclosed is a copy of the subject report prepared by Nancy Orlando-Gay, James Brangan, and Jonathan Wise of Sandia National Laboratories. This report summarized the current status of the National Nuclear Energy Series, which is a 1950's era technical history of the scientific and engineering advances made as part of the Manhattan project.

This report was prepared under the auspices of the Nuclear Transfer and Supplier Policy Division (NN-43) of the Department of Energy, Ms. Trisha Dedik, Director. Comments or questions regarding this report are welcome and may be directed to James Brangan at (505)-844-1832 or to Jonathan Wise at (505)-844-8547.

Sincerely,

A handwritten signature in cursive script that reads "Randall K. King".

Randall K. King
Export Control Program Manager

Enclosure: As stated



