the planning and coordinating of conferences are reported in the second half of the session, together with Belgian experience in developing an SDI announcement service on scientific meetings and the German ZAED effort to collect and make available conference literature.

"Indexing Methods and Systems" covered next contains papers telling of Russian work in setting up a bilingual Russian-English thesaurus for INIS, the EURATOM Cetis automatic indexing project, the development of the CERN subject index and its use in retrieving reports and preprints, and the computer's role in maintaining the EURATOM thesaurus.

The remainder of the symposium volume is devoted to an invited status report on UNISIST, a study of the feasibility of a world scientific information system supported jointly by UNESCO and the International Council of Scientific Unions and INIS papers—a definitive one on the design and implementation of the system by the IAEA personnel responsible for its development and others on its cooperative aspects, and decentralized input processing projects in Sweden and Russia.

This collection of papers like most symposium proceedings covers a wide variety of material, most of it state-of-the-art reports by nuclear librarians, documentalists, and information specialists concerned with putting computer technology to work to assist them in providing information services and devising new techniques to effect scientific communication.

Of the 57 papers included in the publication, 43 are in English, while 8 are in French and 6 in Russian with an English translation of the abstract provided.

Margaret Butler, (AB, Indiana University, 1944) a staff member of Argonne National Laboratory's Applied Mathematics Division, has been in charge of the Argonne Code Center since its founding in 1960 and served as a consultant to the European Nuclear Energy Agency in the planning for their ENEA Computer Programme Library. She headed the Technical Information Subcommittee during her membership on the ANS Publications Committee and is a past Chairman of the Society's Mathematics and Computation Division.

Decontamination of Nuclear Reactors and Equipment

Editor J. J. Ayres

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Reviewer J. A. Buckham

In the preface, Dr. Ayres states the purpose of the book is "to present general information about decontamination operations, especially decontamination of nuclear reactors." This goal is more than achieved by the forty some contributors to this comprehensive technical manual on the decontamination of nuclear facilities. The scope of the work is indicated by selected chapter titles —Cleaning and Defilming Arts, Contamination Mechanisms, Decontamination and Film Removal, Corrosion, Influence of Design on Decontamination, Planning the Operation, Treatment and Disposal of Wastes, Protective Coatings, Specialized Equipment, Ultrasonic Cleaning, Low Temperature Water Cooled Reactors, Pressurized Water Reactors, Boiling Water Reactors, Gas Cooled and Other Reactor Systems, Decontamination of Equipment, Decontamination of Buildings and Laboratories. The list of contributors includes a strong representation of those who have faced routine and severe decontamination problems in the field and have successfully solved these problems. The text is well written with many excellent illustrations, readable data plots, and well-organized summary tables. There are comprehensive subject and author indexes, a glossary of unique technical terms, and valuable lists of proprietary decontamination reagents and equipment. This book is recommended for the engineer who both needs to act in the area of radiochemical decontamination and wishes to understand, to the limits of available basic information, what procedure is best and how to follow it. As the reader understands that decontamination is both an art and a science, he will appreciate the numerous examples of actual large scale decontamination experiences, but will realize that the results obtained in these examples may not be literally translated to his particular problem; the principles involved can be. The book is written particularly for those directly involved with the decontamination of nuclear reactors, and buildings housing reactors and radiochemical processes. For these people, this book will be a standard reference for many years. Those seeking information on the routine decontamination of radiochemical processing equipment in place will not find the same complete guidance, but will find the book very useful for its exposition of principles and general information. In effect, this book is a required reference for any nuclear installation since the scope and depth of the coverage of the subject could not be obtained by a literature search conducted at any one installation in any nation of the world.

J. A. Buckham (PhD, chemical engineering, University of Washington, 1953), is manager of the Chemical Programs Division of Idaho Nuclear Corporation. Dr. Buckham is the author of numerous technical papers in the fields of nuclear fuel reprocessing, radioactive waste management, waste calcining, and other fluidized-bed processes, and the use of nuclear poisons for process safety.

A. Radioisotope X-Ray Fluorescence Spectrometry

B. Neutron Moisture Gauges

C. Monitoring of Radioactive Contamination on Surfaces

Author International Atomic Energy Agency

Publisher Unipub, Inc.

Pages A. 112
B. 95
C. 33

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B. $1.00
C. $2.00

Reviewers John M. Palms
H. H. Nichols

These three books have recently been published by the International Atomic Energy Agency (IAEA), Vien-

na, as part of their continuous Technical Reports Series. Although the books deal with three supposedly different topics, they do have several things in common. First, they are concerned with the practical aspects of the use and/or control of radioactivity. Second, they have seemingly been written for nonbeginners in the nuclear engineering applied radiation discipline as a general introduction to some special subfields and as guides for selecting suitable procedures and techniques.

A. *Radioisotope X-Ray Fluorescence Spectrometry* reports the deliberation of a panel which met in Vienna in May 1968 to review current techniques and applications of radioisotope x-ray fluorescence spectrometry. The purpose of the deliberation was to comment on the factors that limit the performance of this type of analysis and to consider promising lines of development and extensions of present usage. Most of the panel members are well known for the many years they have made contributions to the industrial and commerical applications of radioactivity. Of course, the fact that most panel members were engaged in industrial nucleonics is reflected in the topics and general orientation of the discussions. The book is definitely oriented toward industrial instrumentation and most of the direct applications described are those made with commercially available devices. In addition, the depth of the general discussion in the book is not extensive and as one reads, he wonders for whom the book was really intended. In spite of the lack of in-depth coverage, however, many of the important facets of radioisotope x-ray fluorescence spectrometry are discussed in detail in the excellent papers listed in a rather extensive bibliography. Unfortunately, the bibliography is not completely up to date. The panel discussions took place in 1968, yet these proceedings were not published until 1970. Much of the exciting development in solid state x-ray detectors has taken place in the last couple of years and very few of the developments are mentioned in this book. In addition, the true significance of the usefulness of these new devices is not brought out. It again points out the fact that these kinds of panel meetings are beneficial only to the participants unless the proceedings can be published rather quickly. In spite of these minor drawbacks, the reviewer thinks the book will be of great interest and benefit to those concerned with the possible applications (particularly industrial and commercial) of x-ray fluorescence spectrometry.

The book begins by attempting to put in proper perspective the relative merit of x-ray fluorescence analysis as compared to atomic absorption spectroscopy, atomic fluorescence, polarography, colorimetric, fast neutron, tube x-ray fluorescence, or other techniques of nondestructive testing. Since no specific examples are given of the types of analyses compared here and since the comparison is made in a nonquantitative and very general, relative fashion, it is difficult to assess from this comparison what might be the most useful type of analysis for a particular problem. The section on the types of sources now available is rather complete, although again, some recent advances in gamma-ray sources to be used with the new silicon lithium drift detectors are not discussed. The same can be said about the section on instrumentation and techniques. There is a somewhat complete discussion of sources and detectors given, but again, some of the more recent advances in solid-state detectors are not discussed in depth and some of the discussions are rather misleading. For example, one of the figures shows a theoretically calculated efficiency curve for a Si(Li) drift detector, and it is indicated in the reading, or at least implied, that that kind of an efficiency curve is very easy to calculate and corresponds to the actual detector response. As a matter of fact, the efficiencies of Si(Li) and Ge(Li) x-ray detectors are extremely difficult to measure and calculate because of the many different kinds of detector problems and the lack of good theoretical numbers for attenuation and absorption coefficients. It would have been especially useful to the potential user to indicate some of these problems. A statement is made that the solid-state x-ray detectors are not good for energies less than 3 keV. In the last couple of years this has proven to be false and silicon detectors are now used in the 1-keV region. In addition, the use of the new GE silicon avalanche detector has further lowered that threshold for low energy x-ray detection. It is also stated that high resolution silicon detectors are available only with areas of 80 mm^2 or less. Yet in the last year and a half or so, detectors of very high resolution with areas at least as high as 200 to 300 mm^2 have become available.

In the next few sections, the strongest of the book, several commercial analytical instruments now available on the market, and particular applications of these instruments, are discussed in detail. Discussions are given on the uses of these x-ray fluorescence analyzers in metalliferous mineral exploration developments such as unprepared rock surfaces, drill cores, boreholes, particulate samples, artificially prepared samples, several types of analyses of on-stream process control such as the analysis of slurries, lead in flotation feed slurries, calcium content of cement kiln feed, barium in barytes slurries, tin concentration of tailings streams; copper, zinc, and tin analysis, and analysis of crushed materials, ash content of coal, cement raw mix, and product clinker, etc. There is then a brief section on measuring coating thicknesses with this kind of technique. Several excellent tables are given of the types of analyses made, the sources and instruments used, and the kind of results achieved.

In all these applications a general discussion is presented of the kinds of problems most frequently encountered. These problems include such things as matrix effects, heterogeneity effects, particle composition, particle size and instrument calibration. Again, although the discussions are general, many of the references cited are very detailed discussions of these kinds of problems.

Finally, there are several pages of discussion on the prospects or requirements for this kind of analysis with specific broad and general recommendations to the IAEA regarding future development. This is a helpful, although somewhat incomplete, discussion. Many additional applications, particularly in medical diagnoses and environmental studies, are not mentioned. The future analysis of blood in a clinical situation has recently been shown to have tremendous possibilities. Also, rapid nondestructive analysis of food samples, such as mercury and ar-

senic in fish, is being made practical by x-ray fluorescence. Several of the more important recommendations from the meetings are "that more accurate fundamental data, especially attenuation and excitation co-efficients for low-energy x-rays are required to improve the accuracy of performance calculations." Also, as stated in the last section, "the accuracy and limits of detection of analytical instruments based on radioisotope x-ray fluorescence analysis are strongly governed by interelement effects and alloys and by interelement particle size and heterogeneity effects in minerals. Because of the lack of suitable materials of known composition that exhibit these effects in a known manner, a complete figure of merit for the performance of analytical instruments of this type cannot be obtained at present. The lack of suitable standard materials also inhibits intercomparison of instruments on an international basis and is thought to deter a more rapid acceptance of these instruments, especially in the mining field. The panel strongly recommends that the International Atomic Energy Agency take whatever steps are necessary to overcome this deficiency by taking responsibility for the development and production of a series of samples composed of appropriate combinations of elements of neighboring and widely differing atomic number arranged in a particulate and non-particulate form, homogeneously and heterogeneously spatially distributed so as to form a series of satisfactory test specimens with regard to interelement, particle-size and heterogeneity effects."

This last recommendation is extremely important because until now, the main usefulness of the radioisotope x-ray fluorescence technique has been for single element analysis, and absolute quantitative analysis is extremely difficult, or in many cases, impossible.

This book serves the purpose of giving an overall, general review of the past, present, and future applications of radioactive x-ray fluoreseence spectrometry. For someone not already familiar with this technique, it serves very well as a broad introduction with much good additional detailed information listed in the bibliography. One should merely keep in mind that a review, two years old, in a field progressing as rapidly as x-ray fluorescence spectrometry may, in fact, be somewhat out of date.

B. *Neutron Moisture Gauges* gives an adequate treatise for the users of instruments for measuring moisture in a bulk-type medium. The report is also of value to the instrument designer in that it compiles needed data and discusses theoretical models to some extent.

The information presented permits a potential neutron-moisture-gauge user to make decisions as to whether or not his problem is amenable to a state-of-the-art neutron moisture gauge. This type of information includes

1. sensitivity of moisture in bulk media
2. source strength needed
3. required characteristics of the detector to be used
4. calibration curve shapes
5. possible radiological hazards.

In this effort the report is quite adequate. It does sometimes leave the impression that all problems for which moisture gauging is the solution are problems of bulk media. Again, the report suffers from the rapid change in the state-of-the-art and to some extent the material is already obsolete. For instance, discussions of the use of Californium-252 as a neutron source might have been included; discussions of modern solid-state detectors and their possible applications in neutron moisture gauges could have been included; a treatment of solid-state electronic readouts would also have been helpful. A final criticism is that different portions of the report were obviously written by different people, resulting somewhat in a lack of continuity from one section to another. Overall, however, the report should be a useful contribution to anyone with a knowledge of the fundamentals of applied radiation physics and interested in moisture gauging.

C. *Monitoring of Radioactive Contamination on Surfaces* was prepared by R. F. Clayton, who is associated with the Health Physics and Medical Division of the United Kingdom Atomic Energy Research Establishment. The manual was intended to help those concerned with the implementation of safety standards in work involving the use of unsealed radiation sources. The main emphasis in the manual is placed on guiding the selection and application of suitable procedures and techniques. The book will be most useful for persons responsible for establishing adequate monitoring programs. It must be pointed out, however, that the material presented is largely based on the approach adopted in the United Kingdom Atomic Energy Authority This restricted coverage is somewhat counteracted by a very extensive list of references that covers many practices adopted in other countries. The manual describes how safe contamination levels may be derived from maximum permissible levels in air. There is a useful tabulation of surface contamination limits used by the various atomic energy installations as well as a tabulation of limits recommended by various governmental groups. Also included is a good general discussion of direct and indirect monitoring techniques, performance checks for monitoring equipment, and instrumentation used in checking for surface contamination.

John M. Palms is presently chairman of the Physics Department at Emory University, Atlanta, Georgia. He has worked in the area of fundamental nuclear physics and applied radiation physics for the past 13 years, first as a nuclear research officer in weapons effects analysis in the U.S. Air Force and later as a staff member at Sandia Laboratories and Los Alamos Scientific Laboratory. At Emory he is continuing studies in fundamental experimental x-ray fluorescence yield and Coster-Kronig transition probabilities; he has been actively engaged in applying radiation physics to diagnostic medical, as well as industrial, gauging techniques. He has been a consultant to many nucleonic industries and has written numerous articles in both fundamental nuclear and applied physics.

H. H. Nichols received his MS degree in physics from Vanderbilt and for 16 years was a nuclear engineer specialist at Lockheed Georgia Company. In this capacity he was responsible for the design and development of nuclear gauging techniques and instruments and the evaluation of nuclear detectors for use in gauging applications.