industrial aspects of two-phase flows and data on mass transfer parameters in gas-liquid reactors. The final section of Vol. II is concerned with nuclear reactor safety. Included is a paper by C. W. Solbrig that examines some of the experimental work being conducted on loss-of-coolant accidents (LOCAs). Following this is a two-part paper by G. Yadigaroglu and E. Elias, which evaluates the state-of-the-art of heat transfer and fluid flow in the reflooding phase of a LOCA. Other problems relating to heat transfer problems in nuclear reactors are treated in the remaining papers of the volume.

The final volume of the set covers several different topics. The first section contains papers that deal with boiling phenomena and includes cinematographic and interferometric studies of boiling effects as well as a study of simulation of boiling by use of refrigerants. Modeling studies are the subject of the next section, which begins with a review of the theory of equilibrium homogeneous transient two-phase flow by C. W. Solbrig and D. Gidaspow. Other models treated in this section include a system mean void fraction model for transient phenomena, a dynamic model of gas-heated steam generators, and a model for nonequilibrium effects in rapidly expanding two-phase media. The next section concentrates on heat transfer and pressure studies, and the final section is devoted to unsteady flows and reactor applications. The papers in this last section address problems of phase separation and prediction of pressure and liquid level decrease during a LOCA, burnout experiments on model rod bundles, and dynamic instabilities in steam generator pipes. The volume closes with suggestions for further research and a description of urgent problems in two-phase flows, offered by a group of experts in the field. Inasmuch as ten such experts give their own opinions, it is not possible here to describe them; however, they are of great interest since they are very diverse, reflecting as they do the particular concerns of the individuals involved. The suggestions also indicate that there is much work to be done in the field and that, despite extensive study, two-phase flow investigations still rest on a relatively primitive foundation.

This three-volume set is a very useful reference work on heat transfer in two-phase flows primarily because of its breadth and depth. There are many review-type papers and hundreds of references to the literature, both old and new. An index is provided, but it is rather superficial considering the scope of the work. These volumes are not really suited for service as textbooks, although they are valuable as references. They should be of interest to readers of *Nuclear Technology*, since a good portion of the books is devoted to nuclear reactor problems. There is no apparent attempt at editing for uniformity, which is the rule for works of this sort, so that some papers are much more informative and readable than others. The most glaring omission in the set, in my opinion, is the almost complete absence of detailed numerical analysis of the problems of two-phase flow. Practically all of the analytic work is global, semi-empirical, and correlative in nature. Numerical analysis seems to be a virgin area in the field, perhaps because of the basic uncertainties in the constitutive equations for such flows. Nevertheless, in the journals, papers on theoretical aspects of single-phase flows are almost uniformly numerical analyses. It is expected that there should be a thrust to start numerical modeling of the complicated problems of two-phase flows. On the other hand, experimental investigations were quite evident, covering much material quite completely. But again, there was a certain global aspect to the experiments rather than detailed structural measurements. It is expected that more advanced methods would be applicable, such as hot film anemometry, laser Doppler velocimetry, laser Raman scattering spectroscopy, etc.

On the whole, this set is impressive and useful for reference work in the field of two-phase flow heat transfer. In my opinion, it signals a turning point in the field, where the global aspects of observational study will evolve inevitably to enhanced (numerical) predictive capability and advanced diagnostics for measurement of structural details of such flows.

Pasquale M. Sforza is professor of mechanical and aerospace engineering at the Polytechnic Institute of New York. He has served on the faculty there for 13 years and has been active in the field of heat, mass, and momentum transfer, particularly in the areas of boundary layers and free shear flows. Dr. Sforza pioneered detailed studies of three-dimensional turbulent jet flows and is currently involved in studies of two-phase combustion chamber and nozzle flows for ramjet engines.

The Chemical Thermodynamics of Actinide Elements and Compounds
Vol. I, *The Actinide Elements*
Vol. II, *The Actinide Aqueous Ions*

Authors	Vol. I, F. L. Oetting, M. H. Rand, and R. J. Ackermann Vol. II, J. Fuger and F. L. Oetting
Publisher	International Atomic Energy Agency (1976)
Pages	Vol. I, 111 pages; Vol. II, 65 pages
Price	Vol. I, $8.00; Vol. II, $5.00
Reviewer	Gregory R. Choppin

These small books are the first two of a series of critical evaluations on an international basis of thermodynamic data of actinide systems of interest to nuclear science and technology. Both monographs are well organized and, in simple direct statements, offer expert critiques of thermodynamic data. Emphasis is placed on the reliability and consistency of the data as well as on the authors' judgment of its accuracy. Data are presented in both SI and older units in separate tables.

The first monograph evaluates data on allotropy, heat capacity, melting point and heat of fusion of the solid and liquid metals, as well as vapor pressure and other thermodynamic properties of the ideal monatomic gases. Thorium through curium is covered, with briefer discussion of berkelium and californium. A summary section does an excellent job of comparing and correlating the data. The data are presented in tabular form as a function of temperature in the final 54 pages.

The second monograph is similar in format, evaluating the data on the formation of the aqueous ions in the various oxidation states. Thorium through berkelium are covered in detail, and californium through lawrencium more briefly.

The authors have been successful in their goal of providing a critical summary of thermodynamic data on the actinide elements that would be of use to "nuclear engineers and/or physical scientists concerned with problems in nuclear systems."

Gregory R. Choppin is a professor of chemistry at Florida State University. His areas of interest include inorganic-nuclear chemistry, chemical properties of the organic and inorganic complexes of lanthanide and transuranium elements, ion exchange and solvent extraction studies of these elements, nuclear reactions, charged-particle-induced fission, and the structure of water and aqueous solutions.

Uranium Ore Processing

(Proceedings of an International Atomic Energy Agency Symposion, November 1975)

Publisher International Atomic Energy Agency (Distributed by Unipub, Inc.)

Pages 238

Price $19.00

Reviewer Arturo Bronson

The International Atomic Energy Agency (IAEA) organized this Proceedings to bring together new information on uranium ore processing. Eighteen papers were presented and 49 participants attended the symposium held in November 1975.

Three major subjects have been covered by the Proceedings: uranium ore processing, the problems associated with ore processing, and uranium recovery from seawater. The sessions containing papers on uranium ore processing are the following: uranium ore milling practice (five papers); known and partially engineered techniques that have not reached full application in milling of uranium ores (one paper); processing of low-grade resources (four papers); *in situ* leaching (one paper); uranium as a by-product and by-products from uranium ores (one paper). A valuable session containing three papers was held on the problems associated with uranium ore processing. A session containing two papers discusses the design considerations for the recovery of uranium from seawater.

In the appendix, the IAEA has classified several uranium plants according to extraction processes in tabular form. In addition, the tables present the following general information on each uranium plant: ore characteristics, type of milling, type of leaching, solid/liquid separation, and the type of concentration/purification systems. The appendix also contains a summary of the new uranium plants, their type of deposit, and the proposed extraction methods that are being investigated.

The symposium could have been better organized. For example, papers on ore processing are presented in five different sessions, although three sessions contain only one paper. Also, it appears that the text was not edited, because the micrographs lack magnification scales and some papers lack conclusions and summaries.

The text is intended for engineers in the uranium ore processing field and serves to bring the engineers up-to-date in the field. Although the technology presented is somewhat superficial, the papers bring together valuable information acquired since the IAEA's 1970 symposium.

Arturo Bronson (BS, MS, metallurgical engineering, University of Texas at El Paso; PhD, metallurgical engineering, Ohio State University) teaches extractive metallurgy in the Metallurgical Engineering Department at The University of Arizona, which he joined in August 1978. He presently is involved in research projects concerning thorium extraction, high-temperature chemical metallurgy, and copper refining.

Radiological Safety Aspects of the Operation of Neutron Generators

Author R. F. Boggs

Publisher International Atomic Energy Agency (Distributed by Unipub, Inc.)

Pages 42

Price $3.50

Reviewer A. Keith Furr

This short book is intended for neutron generator operators who have had very little prior experience or training in health physics or radiation safety. As such, it does not attempt to cover any specific topic in detail.

The book is divided into four sections. The first is a brief but clear description of the major features of small neutron generators. The second section discusses the radiation hazards and preventive measures that should be employed to reduce or eliminate their effect. The third section deals with monitoring devices and instruments, and the fourth section covers the broadened aspects of an adequate radiation safety program. There are two appendixes, one dealing with nonradiation hazards and safety considerations and the other describing the desirable features of a neutron generator laboratory.

Although brief, as noted above, the second section on hazards is quite adequate for the purpose intended. It describes the hazards most likely to be encountered and gives typical values for the level of these hazards. A relatively untrained operator should be able to gain an appreciation of the dangers involved in normal operation of the generators.

In a few instances, one might wish more information. For example, when speaking of storing targets and used oil contaminated with tritium, the author suggests using containers made of material through which tritium will not