BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Ocassional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

The Physical Principles of Heat Pipes

Authors	M. N. Ivanovskii, V. P. Sorokin, and I. V. Yagodkin
Publisher	Oxford University Press, New York (1982)
Pages	262
Price	$69.00
Reviewer	Monte V. Davis

The Physical Principles of Heat Pipes is a basic text in heat pipes and heat pipe technology written in a lucid fashion and containing information on all phases of heat pipe design, construction, and operation.

The book is divided into five sections: Driving Forces, Hydrodynamics, Heat and Mass Transfer, Dynamics, and Methods of Calculation. Where it is necessary for clarity, there are good examples of operating systems to demonstrate a phenomenon or an effect. Throughout the book the authors assume that the reader has a good basis in mathematics and a good knowledge of engineering fundamentals, such as interfacial wetting forces, two-phase flow, gas flow at sonic velocities, capillary limitations to flow, and overall system dynamics.

As with most publications written in Russian, published, translated, and republished, the references are old (the latest date on any reference is 1976). Also there is a computer program for heat pipe calculations that is of little use with today's computers and computing methods.

Despite these criticisms the book is extremely useful and should be a valuable addition to the library of anyone working in the field of, or teaching about, heat pipes.

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Radioactive Waste Disposal (Vol. 1: The Waste Package)

Author	Rustum Roy
Publisher	Pergamon Press, Incorporated, Elmsford, New York
Pages	232
Price	$27.50
Reviewer	Aaron Barkatt

In this volume, Rustum Roy sets out to fill a pressing need for a comprehensive overview of the current status of an important and rapidly developing area of nuclear science and technology. In general, the organization of this volume is well designed to survey this subject for the general scientific community. The various chapters give a concise coverage of the main aspects of waste package development, and each chapter is accompanied by a short synopsis, several sets of representative tabulated data, and a list of selected references. The use of complex symbols and equations is avoided. Detailed description of the properties of glassy and crystalline, mineral-based waste-form materials is given separately in two well-written appendixes at the end of the volume. A well-written chapter on radiation and transmutation effects (by E. R. Vance) is included.

Many state-of-the-art reviews covering large fields of technology consist of edited collections of articles by experts representing various research groups and various approaches. In this instance, however, the author relies almost exclusively on contributions by himself and by his co-workers at Pennsylvania State University. This has the advantage of having the material presented on a unified and structured basis. On the other hand, this policy can easily lead to an overemphasis on results and views of the author and his co-workers. Anybody who has studied, even superficially, the development of waste package materials must be familiar with the pioneering and extensive work done at Pennsylvania State University. In view of this, detailed discussions of the origin of certain proposed waste-form compositions, for instance, sometimes appear too specific for the general reader.

As a result of the author's long and extremely fruitful work on immobilization materials and systems, he has reached certain conclusions concerning technologies and policies of future waste management. He rightly emphasizes the importance of treating the radioactive waste disposal system as an integrated unit, the need to assess the relative strengths of the interactions that take place among the various components of the system (e.g., strong effects of the overpack/backfill on waste package chemistry versus weak waste package/host rock interactions), and the need for well-defined and unambiguous terminology. Based on this approach, the author presents a systematic analysis of major proposed waste forms in the context of varying waste compositions and interactions with the other components of the waste disposal system. The author succeeds in making a strong case for his conclusions concerning (a) the need for further development of various immobilization systems that differ in their choice of waste-form materials as well as of other waste package components and of the disposal medium (geologic repository, shallow or surface sites, sea bed), (b) the lack of unique significance of thermodynamic metastability of immobilization materials, (c) the widely differing nature of various waste streams and its impact on the selection of various technological solutions, based in each case on the performance, the simplicity, and the cost of the system, and (d) the need for carrying out tests under conditions relevant to the expected service environment.

It is unfortunate that in several instances the author's strong convictions lead to somewhat extreme statements such as "The continuing neglect of this [cement-matrix] option by decision makers everywhere is evidence of technological momentum generated by a combination of ignorance of or a lack of understanding of the data, fear of change from an apparently working solution, vested interest in maximum cost solutions etc." It is hard to see how the growth of public confidence in the same "decision makers," which is essential for acceptance of lower cost solutions (such as those rightly recommended for consideration by the author), could benefit from such statements. In another place, the use of leach data in rating waste forms is characterized as "dangerous nonsense" although the alternative capsule tests appear to be relevant mostly in a higher temperature range than the range usually expected for defense waste, as well as for commercial waste aged more than 300 years in a canister; therefore, a combination of tests is likely to be necessary in the general case. It would have been preferable in view of the purpose of the book if these views were presented along with the other conclusions in the concluding section in a more moderate and more substantiated form.

A serious drawback of the book stems from the fact that despite a justified emphasis on clarity and precise terminology, the book contains a large number of apparent contradictions, obscure statements and terms (e.g., "low conidation," "remotable equipment," "viscous glass," "thermodynamic ore"), and errors. The absence of an index is a noticeable defect, as is the mediocre quality of the printing.

A large number of these shortcomings are consequences of the author's pioneering attempt to provide a badly needed overview of nuclear waste technology, and they do not nullify the achievements of the author in organizing present data, reducing ambiguity, and encouraging more systematic studies and perspectives in this area.

Aaron Barkatt is an associate research professor at the Vitreous State Laboratory, The Catholic University of America. His main research interests include the chemistry and surface properties of glasses with applications in high- and low-level waste technology, and radiation effects.