As presented in Chap. 11, radioactive waste management includes a broad range of activities and concerns. The appropriateness of this is well founded. Sources of wastes, their types and amounts, the processing strategies, the storage and/or disposal of the wastes, and a host of more specific and technical concerns only hint at the effort and understanding that has gone into this general issue. The summary-type discussion presented here will serve a useful role in the education of the somewhat enlightened student as well as a concise reference for the practitioner.

The final three chapters of *Nuclear Chemical Engineering* focus on isotope separation. By way of introduction, a brief and somewhat incomplete overview of principal separation methods used for the more important isotopes is presented in Chap. 12. The vocabulary and broad relationships relevant to separating units, differential stage separation, and basic cascade theory are adequately introduced along with selected but important concepts such as the ideal cascade, minimum reflux, minimum stages, equilibrium time, inventory, and separative work.

Light element isotope separation is considered in Chap. 13. Following some basic and historical information on deuterium separation, the various processes for hydrogen isotope separation are discussed: distillation of hydrogen; distillation of water, including some design/hardware-oriented "working" equations; electrolysis; and various exchange processes, with emphasis appropriately placed on the Girdler-sulfide process. This chapter concludes with a brief discussion of the lithium exchange process and only a mention of separation processes for the carbon, nitrogen, oxygen, and sulfur isotopes. This imbalance and the omission of any significant discussion on boron isotope separation are of academic, but not practical, concern.

The most extensive chapter in the text is the final chapter. The subject of uranium isotope separation is introduced on an historical note and with an overview of current (as of about 1978) projects. Following this introduction, a reasonably complete treatment of gaseous diffusion is presented. The principle and history of gaseous uranium diffusion are discussed, and equipment used by the U.S. and the French gaseous diffusion programs is described. Barrier flow theory and relationships for separation and mixing efficiency are provided. Stage design aspects are discussed in context, with working equations and examples, including economic calculations. The gas centrifuge process is dealt with in a similar fashion, but more limited to separative performance relationships for the machine itself. The aerodynamic methods of Becker and UCOR are treated only briefly, as are mass and thermal diffusion.

The treatment of the advanced isotope separation processes is quite limited. The two laser processes are described, with the discussion of atomic vapor laser isotope separation (the process recently selected by the U.S. Department of Energy for further demonstration) largely following that provided in a 1977 Jersey Nuclear-Avco Isotopes paper and the discussion of molecular laser isotope separation drawn largely from the early work of Jensen and Robinson at Los Alamos National Laboratory. It is granted that classification and the developing nature of these processes preclude any in-depth discussion. However, the fact that there is no significant basic theory provided, no scoping equations, and no first-order technical treatment of the key issues and directions is a weakness that cannot be easily attributed to the status of classification or of technology at the time of writing. Added to this is the omission of the plasma separation, chemical exchange, and ion-exchange processes, which are all receiving attention today as they have been for the last five or more years. With this weakness, the book ends on a dated note, and some of its utility as a text or reference work for fuel cycle engineers of the future is accordingly diminished.

The fact that some topics are dated and/or too incompletely dealt with does not, however, take too much away from the book's considerable utility. Its assets—including generally good coverage of material, adequate references, and good problems—far outweigh any deficiencies noted by these reviewers. It is a tour de force, an obvious labor of love by the authors, and a welcome and highly recommended addition to the fuel cycle literature.

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Radioactive Decay Data Tables: A Handbook of Decay Data for Application to Radiation Dosimetry and Radiological Assessments. By David C. Kocher. Technical Information Center, Oak Ridge, Tennessee (1981). 221 pp. $13.75.

This useful handbook is an updated and expanded version of a previous report by the same author[1] and is one of several similar compilations[2,3] of radioactive decay data that have appeared in recent years. This new compendium contains recommended decay data for ~500 radionuclides of interest in nuclear medicine and fusion reactor technology or of potential importance in routine or accidental releases from the nuclear fuel cycle.

[1]D. C. KOCHER, "Nuclear Decay Data for Radionuclides Occurring in Routine Releases from Nuclear Fuel Cycle Facilities," ORNL/NUREG/TM-102, Oak Ridge National Laboratory (1977).

[2]L. T. DILLMAN and F. S. VON DER LAGE, "Radionuclide Decay Schemes and Nuclear Parameters for Use in Radiation-Dose Estimation," Pamphlet 10, Society of Nuclear Medicine, New York (1975).

[3]M. J. MARTIN, "A Handbook of Radioactivity Measurements Procedures," Report No. 58, p. 306, National Council on Radiation Protection and Measurements (1978).

The tables, presented in Appendix 5, contain the energies (both average and maximum in the case of $\beta^{\pm}$ particles) and absolute intensities of all major radiations, both nuclear and atomic, which occur in the decay of a given nuclide. In addition, for each major radiation, the tables include Δ, the mean energy emitted per decay, in units of g·rad/μCi·h. Radiations with intensities of <0.10% are not listed individually. However, immediately following the listings for alpha, beta and gamma radiations, the number of omitted low-intensity radiations is printed, along with their average energy and total intensity.

The primary source of the decay data presented in this handbook is the Evaluated Nuclear Structure Data File (ENSDF), developed and maintained by the U.S. Nuclear Data Network.[4] Since the evaluation effort for the present publication was carried out concurrently with that aimed at building up ENSDF, significant selective updating and independent evaluation were required of the author. His data base incorporates ENSDF data and all experimental results reported prior to July 1, 1979.

The handbook's organization into seven short descriptive chapters and five appendixes is explained in Chap. 1. Chapter 2 presents a concise review of the various radioactive decay processes, while Chap. 3 describes ENSDF and the evaluation process and standards. As the author points out, some of the discussion in Chaps. 2 and 3 is probably not comprehensible to nonexperts, but the inclusion of material of a specialized nature serves to remind users of the complexities involved. Chapter 4 describes the tables and the computer code MEDLIST used to produce the tables from ENSDF. The MEDLIST code also outputs computer-readable data suitable for use as input for further calculations. Some applications of these decay data to radiation dosimetry and radiological assessments are described in Chap. 5. Chapter 6 briefly summarizes parent-daughter activity ratios wherever both are radioactive. The final chapter is addressed below.

The first four appendixes serve mainly to explain and support the data tables in Appendix 5. I suspect that the new information in the expanded index (Appendix 2)—reference key numbers and file-creation dates—will be of interest mainly to other evaluators. The reference information would be more convenient if included in the appropriate data table.

Chapter 7 is a valuable addition to *Radioactive Decay Data Tables*. The author discusses those radionuclides for which, in his opinion, the adopted decay data may contain significant uncertainties or errors due to the lack of appropriate experimental data. The importance of missing data, e.g., the nonobservation of a substantial fraction of the gamma-ray strength in the decay of short-lived nuclides with large Q values, is becoming increasingly evident in decay heat determinations. Kocher performs a valuable service not only by cautioning users about incomplete data, but by also calling attention to the need for additional (and possibly new kinds of) experiments.

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[4] W. B. EWBANK and M. R. SCHMORAK, "Evaluated Nuclear Structure Data File—A Manual for Preparation of Data Sets," ORNL-5054/R1, Oak Ridge National Laboratory (1978). Requests for data contained in ENSDF should be addressed to the National Nuclear Data Center, Brookhaven National Laboratory, Upton, New York 11973.