faculty to take sabbaticals in North America. 78% of the respondents said they would participate in such a program, but 45% of them would want the program to be funded externally.

The third proposal, to invite PhD graduates with Third World degrees to do one or more postdoctoral years in North America, was less enthusiastically received. 57% of the responses indicated participation and 17% would not be interested. 27 departments would like to see separate external funding and an equal number felt that some support could come from ongoing contracts or programs in their departments.

The Third World Subcommittee is now chaired by Prof. C. J. Barr, California State Polytechnic University, Pomona. He would welcome your suggestions and inquiries.

BOOK REVIEW: Nuclear ChE

Continued from page 77.

Chapter 4 lays the foundation for solvent extraction and systems are selected for illustrating principles and practice. Included is a brief accounting of the types of commercial equipment.

Uranium, thorium and zirconium have sperate chapters devoted to the physical and chemical properties of the element and its compounds and the associated processing.

Chapters 8, 9 and 10 deal with the processing of irradiated fuel and materials. The identification of the radionuclides of interest and the time-dependent behavior in and out of the reactor are presented and illustrated in Chapter 8. Detailed information on plutonium and other actinide elements (proactinium, neptunium, americium and curium) is given in Chapter 9, and Chapter 10 is devoted to fuel reprocessing. Both U.S. and overseas reprocessing plants are noted. The lack of an operating commercial reprocessing plant in the United States has perhaps placed an undue emphasis on the design calculations for the Barnwell Nuclear Fuel Plant.

Rightfully, radioactive waste management is singled out for Chapter 11. The focus, however, is primarily on high-level wastes. A "most recent estimate of the amount of solidified high-level wastes to be accumulated at a federal repository in the United States . . ." turns out to be a 1976 reference with an over-optimistic projection of nuclear power and the achievement of the repository. The authors have recognized the uncertainties in the projections and sought to place in perspective the relative magnitudes of the volumes and curies of the high-level wastes with respect to the natural radioactivity in the earth's crust. Nevertheless, this outdated reference serves to illustrate the practical difficulties in updating the material for this work.

Isotopic separations are the topics for the last three chapters. Methods and principles are given for stable isotopes in Chapter 12. Chapter 13 presents processes for the separation of isotopes of hydrogen and other light elements. The final chapter is on the separation of uranium isotopes.

In my judgment, the authors have provided a wealth of technical information on the nuclear fuel cycle and have been successful in highlighting important principles and in providing meaningful illustrations. Each reviewer, however, may seek to augment this outstanding contribution with still more features. For example, elements of safety and the protection of the public health have been interwoven into the various chapters, but on too modest a level from my point of view. What is needed is an additional chapter on safety. What are the special approaches used to cope with the impact of this new industrial development upon society? What are the guiding safety philosophies and regulatory requirements? What are the techniques that can be used to identify and evaluate risks? Is there a new emerging role for the engineer to be more responsive to societal issues in providing inputs for evaluating acceptable risks? □

ALTERNATIVE FUELS: CHEMICAL ENERGY RESOURCES

By E. M. Goodger
John Wiley & Sons, NY. 1980

Reviewed by H. H. Lee
University of Florida

This is a useful reference for those who would like to get a broad picture of alternative fuels as well as for those who want some pertinent data in certain specific areas. Fuel specialists may find it useful in relating their area of specialty to the overall picture of alternative fuels. As the author adequately puts it, the book is offered as one convenient format for the collocation and analysis of relevant data scattered about the literature.

The alternative fuels considered in this book are those intended for oxidation only and so the wider field of alternative energy sources such as wind, tides, geothermal, direct solar radiation and nuclear fusion is excluded from consideration. It deals with alternative ways of using conventional fuels by modifying the forms and ap-

Continued on page 88.

The overhead product is to contain 99 mole % A, and the recovery of A is to be 99%. With these specifications it is reasonable to assume that the overhead contains only A and B, and a good estimate of the bottoms composition can be made:

$$x_{1,b} = 0.0067$$
$$x_{2,b} = 0.3267$$
$$x_{3,b} = 0.2500$$
$$x_{4,b} = 0.4166$$

A first assignment for calculations in this case could be as follows:

1. **For a reflux ratio in the range L/d = 1 – 2, calculate up the column until a zone of constant composition is reached. Prepare a plot of liquid composition vs. plate number. Select a reasonable tray for introducing the feed and calculate up the column to the product composition. Try two more feed tray locations. Which choice of feed tray requires the minimum number of trays for the specified separation?**
2. **Study the effect of decreasing L/d. Try a series of values until you reach a value where the specified separation can not be achieved. What happens?**
3. **Rewrite the problem for a case where a split is to be made between components 2 and 3. For example, specify that recovery of B in the overhead is to be 99% and recovery of C in the bottoms is to be 99%.**

With these exercises behind them, students are well prepared for more formal developments of multicomponent distillation calculations.

The results of calculations for a reflux ratio (L/d) of 1.2 are summarized in the Table below and in Fig. 1. Tray 8 was selected as the feed tray after inspecting a graph of tray number vs. mole fraction in which calculations were performed from still to a pinch region (at about tray 18).

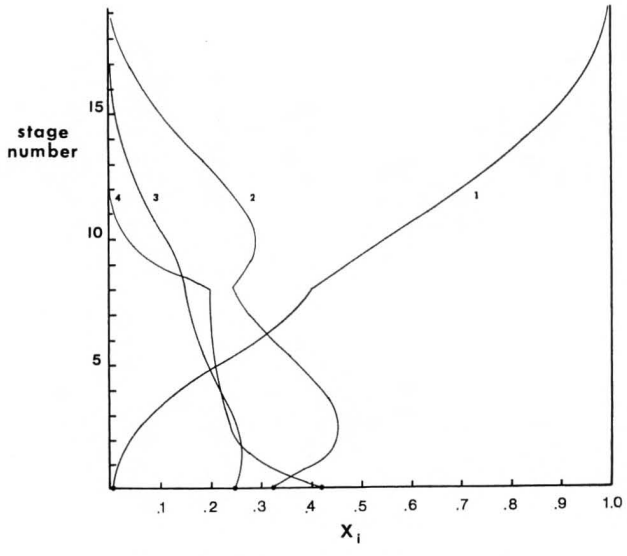

FIGURE 1. Results for L/d = 1.2

Summary of Results for L/d = 1.2

Tray number	x_1	x_2	x_3	x_4
Still	0.0067	0.3267	0.2500	0.4166
2	0.0410	0.4531	0.2574	0.2485
4	0.1417	0.4205	0.2174	0.2204
6	0.3001	0.3181	0.1756	0.2061
8	0.4058	0.2449	0.1516	0.1978
10	0.5676	0.2916	0.1103	0.0305
12	0.7105	0.2321	0.0542	0.0032
14	0.8402	0.1388	0.0207	0.0003
16	0.9311	0.0623	0.0066	1.7431×10^{-5}
18	0.9814	0.0167	0.0019	1.0564×10^{-6}
(y_{18})	(0.9932)	(0.0063)	(0.0005)	(1.3858×10^{-7})

Values of x and y can be recorded for each tray, of course, but liquid mole fractions on even-numbered trays were chosen here as sufficient to define a graph of tray numbers vs. liquid mole fraction. □

Editorial Note: A more complete set of programs providing for calculations beginning at either the top or bottom of a column is available and can be obtained by contacting either of the authors of this article.

NOMENCLATURE

x_i = mole fraction of ith component in liquid.
y_i = mole fraction of ith component in vapor.
α_i = relative volatility of ith component.
L = Liquid flow rate in rectifying section, moles/hr.
$\overline{L}$ = Liquid flow rate in stripping section, moles/hr.
b = Flow rate of bottoms product, moles/hr.
d = Flow rate of overhead product, moles/hr.
m + 1 refers to plate above mth plate in stripping section.
n + 1 refers to plate above nth plate in rectifying section.

BOOK REVIEW: Alternative Fuels

Continued from page 85.

plications of these fuels, and with the unconventional fuels that can be derived from both conventional and unconventional fuels. The author then examines and compares each of the alternatives in terms of combustion characteristics, and combustion performance.

The last chapter is devoted to those fuels which appear to hold particular promise, which are coal conversion products, alcohol and hydrogen.

This book is informative and may be useful as a reference in an introductory course on fuel. □