The Concept of Energy

Author E. J. Hoffman

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Reviewer M. R. Bottaccini

This disordered grab-bag of a book is the latest product of the Ann Arbor vanity press. Disorganized mathematical impediments are mixed in indescribable confusion with routine applications, historical tidbits, and pseudo-philosophical musings. The language is diffuse, self-indulgent, not idiomatic, and occasionally ungrammatical. A thoroughly bad book.

The first chapter is advertised as an abstract discussion of energy but is actually no more than 45 pages of statements about the relationship between the first integral of an array of first-order ordinary differential equations and a limited mathematical model of energy conservation. Much effort is spent in maintaining a theoretical difference between the "exact" differentials of an analytical solution and the "inexact" differentials of a numerical solution. Such a difference has no foundation in theory or practice. The first chapter could be reduced to five pages without doing harm to its contents and could be eliminated completely insofar as its usefulness to the rest of the book is concerned.

Hoffman proceeds to discuss elementary fluid-and-thermodynamics mixed with lengthy, and not very enlightening, theoretical asides. Some of the later excursions are misconstrued or misunderstood and are at times less general than the preceding argument. A good example of such nongeneralizing generalization is the discussion of viscosity presented in Chap. 2: The author defines viscosity in terms of ultimate state resistance to the motion of a body under the influence of gravity, but introduces a number of volume and surface integrals to disguise the simplicity of the definition.

It is such use of volume and surface integrals, especially in Chaps. 2, 7, 8, and 9, that shows the principal lack of theoretical depth. Although the book jacket claims that "representation of flow systems in terms of volume and surface integrals is a new and powerful approach," it is obvious that the author is not aware of the routine use of such integrals in elementary third-year engineering textbooks and has never come into contact with the simplest integral transport theorems of rational mechanics.

The citations give a clue to the intellectual problem faced by the author: The references to applications are relatively recent, whereas the theoretical citations had their birth in the scientific dark ages. Both the author and the reader would do better to read C. Truesdell and R. A. Toupin's "The Classical Field Theories," in the *Handbuch der Physik* (Springer Verlag, 1960). What Hoffman fails to do in his entire volume, Truesdell and Toupin did in approximately 100 pages of Chap. III-E.

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Separation of Hydrogen Isotopes

Editor Howard K. Rae

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Reviewer Frank A. Iddings

Separation of Hydrogen Isotopes is not an all-you-ever-wanted-to-know-about-hydrogen-isotope-separation-but-were-afraid-to-ask kind of book. It is a collection of papers presented at a 1977 symposium cosponsored by the Physical Chemistry Division of the Chemical Institute of Canada and the Canadian Society for Chemical Engineering at the Second Joint Conference of the Chemical Institute of Canada and the American Chemical Society.

The hardbound volume is No. 68 in the American Chemical Society Symposium Series and contains 13 papers. The first paper, "Selecting Heavy Water Processes" by the editor, Howard K. Rae, is an excellent discussion of industrial processes for obtaining heavy water and the rationale for selection. Some of the information contained in the paper might have been easier to digest in tabular form but, with the index, can be located easily enough. Anyone interested in the status of industrial heavy water production should find this paper useful.

Paper 2 by G. D. Davidson deals with the performance of the Bruce Heavy Water Plant at Triverton, Ontario, Canada. Included is information on safety, environmental effect, and process difficulties as well as output. Papers 3, 4, and 5 deal with hydrogen isotope separation through the hydrogen-amine process rather than the H_2S-water (Girdler-Sulfide) process that presently dominates industrial separation. Importance of the catalyst and its properties are well presented in the hydrogen-amine papers. Also, linkup of the hydrogen-amine separation plant with ammonia plant synthesis gas feed stock is well presented.

Paper 6 by Nitschke et al. presents the pros and cons of the UHDE hydrogen-ammonia process for heavy water production. The coupling with the synthesis gas section of an ammonia production plant is noted to be of vital importance.

Novel catalysts for isotope separation using the hydrogen-water exchange are described in paper 7 by Butler et al. Of special interest is the improvement of catalyst performance with increasing hydrophobic nature of the catalyst. Paper 8 by Hammuli et al. continues the hydrogen-water exchange process by describing a "Combined Electrolysis Catalytic Exchange (CECE) Process for Hydrogen Isotope Separation." Pilot plant studies are in progress.

While distillation of enriched heavy water is used in some of the preceding processes, all use some exchange

reaction to provide a heavy-water-enriched feed for distillation. Kaiser et al. in paper 9 present state-of-the-art techniques for distillation of low concentration (150 ppm D_2O) feed stock. Improvements in the low-temperature parallel plate separation columns are presented with theoretical limits to such systems.

Papers 10 and 11 give visions of processes of the future utilizing lasers. Paper 10 by Marling and Simpson of the University of California and Miller of the Massachusetts Institute of Technology is a well-referenced discussion of separation of deuterium using "Vibrationally Enhanced Deuterium Halide-Olefin Addition Reactions." Economic considerations as well as specifics on potential compounds and lasers that may be practical are presented. In paper 11, S. H. Bauer of Cornell gives theoretical and parametric values for some laser-augmented separations through adduct production.

Papers 12 and 13 deal with removal of tritium from heavy water and waste water, respectively. Pautrot and Damiani detail experience with removal of large quantities of tritium (and hydrogen) from high flux reactor heavy water moderator. It is unusual to see so much real operating experience presented outside of the "attitude adjustment" periods that generally follow a day of technical presentations. Such information should be valuable and satisfying to many who are similarly involved. Paper 13 by Rogers et al. of the Mound Laboratory of Monsanto Research Corporation provides a brief account of using the CECE process (see papers 7 and 8) to remove tritium from gaseous and liquid waste streams.

When combined with earlier collections of papers such as *Isotope Effect in Chemical Processes* by William Spindel (1969) and *Isotopes and Chemical Principles* by Peter A. Rock (1975), this volume should keep any individual adequately informed on theory, methods available and reasons for their selection, and industrial hydrogen isotope separation. This last volume should be valuable for some time to those interested in the state-of-the-art in industrial heavy water separation processes.

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