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Book reviews

Chemical and Engineering Thermodynamics, 3rd Edition. Stanley I. Sandler, John Wiley and Sons Inc., 1999, 772 pp., hardback, £32.00, ISBN 0-471-182109

This is the third edition of an undergraduate textbook in chemical engineering thermodynamics. It can be considered to be the fiercest competitor of the true classic in this subject by Smith and Van Ness [1]. Its author is a prominent, productive and active researcher in this field and is well known for his close contacts with the chemical industry. He is also highly appreciated by his colleagues, young and old, for his sharp, concise and clear contributions at large international conferences. But here we see him as a teacher who has been engaged in a massive task to transmit his teaching experience to the new generations of chemical engineers.

The author claims to have had the objective 'to develop a modern text that was relevant to other parts of the chemical engineering curriculum, specifically courses in separation processes, chemical reactor engineering and process design'. In this, I believe, he has fully succeeded, making thermodynamics a highly appreciated discipline in any chemical engineering department. His other objective was to organise the material in sufficient detail and in such a way as to give the student a good understanding of principles and their applications. Again he has more than succeeded, with a lot of work put into illustrative and practical examples and problems. But a textbook of nearly 800 pages needs useful instructions, to teachers and students alike, on priorities and selection of topics. This, unfortunately, is missing.

Professor Sandler, in editing the third edition of his book, observes three important changes in engineering education in recent decades:

- the availability of powerful, desktop computers,
- greater concern about safety and the environment, and
- the application of thermodynamic principles to new technology areas such as biotechnology, polymers and solid-state processing.

This edition provides for all three changes to some extent, but most successfully for the first one which brings, in the words of the author, engineering science, industrial practice and undergraduate education much closer together and much closer to the student: as close as his or her dormitory room....! For this the author deserves our most sincere compliments. This edition provides a dedicated set of programs for many sorts of thermodynamic calculations and predictions and allows the use of computer programs such as MATHCAD. An important change that has been overlooked, however, is the need for the thermodynamic analysis of processes (see for example chapter 16 [1]) which has become more and more prominent in a world that wants to become more efficient and sustainable in the use of energy.

A final remark on the way the book introduces the second law and the concept of entropy. I believe that this has been done in a rather intellectual way, based on the concept of balance equations. In a systems approach towards process design, balance equations are, admittedly, essential but the essence of the second law is the pertinent direction of processes governed by the greater probability of future states and by some of the ultimate driving forces in nature as identified for example by non-equilibrium thermodynamics [2]. Lewis and Randall [3] have shown with heart and intellect how a quantitative measure for the spontaneity of a process can be identified in entropy and entropy generation and how elegantly this can be connected to Boltzmann's famous postulate on entropy and thermodynamic probability. But I realise that this is a personal opinion and that the reason for so many textbooks on thermodynamics is the many different views that exist on how it should be taught. I expect that Sandler's textbook may well be the most popular text on the subject for some time.

References

[1] J.M. Smith, H.C. Van Ness, M.M. Abbott, Introduction to Chemical Engineering Thermodynamics, McGraw-Hill, 5th edn., 1996.
[2] A. Katchalsky, P.F. Curran, Non-Equilibrium Thermodynamics in Biophysics, Harvard University Press, 1965.
[3] G.N. Lewis, M. Randall, as revised by K.S. Pitzer, L.B. Brewer, Thermodynamics, 2nd ed., McGraw-Hill, 1961.

Prof. Dr. Ir. J. de Swaan Arons
Laboratory for Applied Thermodynamics and Phase Equilibria, Delft University of Technology
Delft, The Netherlands

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