

Sources and Control of Air Pollution

By Robert Jennings Heinsohn and Robert Lynn Kabel, Prentice Hall, Upper Saddle River, NJ, 1999, 696 pp., \$105.00.

Professors Heinsohn and Kabel have written a very good introductory air pollution text appropriate for undergraduate seniors. According to the authors, their intent is to present the topic "with mathematical rigor commensurate with . . . professional practice." Thus, their text is not intended to be as encyclopedic as *Atmospheric Chemistry and Physics* by John H. Seinfeld and Spyros N. Pandis, but it is well suited to its intended audience and purpose. In keeping with the stated goal, the text is easy to read with an informal style and plenty of examples. For readers interested in greater depth, the reference lists in each chapter are quite good.

The text is divided into three sections: Setting the Stage (2 chapters), Basics and Constraints (4 chapters), and Engineering (7 chapters).

Section One discusses risk, risk management, and liability; reviews key concepts from material and energy balances, thermodynamics, kinetics, and chemistry; and introduces biodiversity, population growth, climate change, and the greenhouse effect. Chemical engineering seniors should recognize some of the material from their core courses, but will probably appreciate the review. The material covering risk and ecology will be new to many students as a subject of formal study, but should be

somewhat familiar since these topics appear regularly in the popular press.

The section entitled "Basics and Constraints" covers legislation, respiratory effects, aesthetics, and atmospheric chemical cycles. Since Heinsohn and Kabel are registered engineers in Pennsylvania, they use Pennsylvania and Federal legislation and regulations in their discussion; however, they point out where to expect variation among states. Chapters on respiratory effects and aesthetics introduce students to toxicology, physiology, and environmental science. The discussion of atmospheric cycles encourages students to regard the atmosphere as a reactive transport system with sources, reactions, transport, and sinks of various species.

The "Engineering" section covers modeling and control of emissions. It includes chemical and physical processes leading to emissions of gas and aerosol phase pollutants. Combustion kinetics and the design of cyclic combustion machines are covered in a chapter that should be accessible to students who have taken thermodynamics and chemical kinetics courses. Mass transfer and dispersion are covered in two chapters. Although mass transfer is part of the typical undergraduate chemical engineering curriculum, dispersion and plume modeling are not routinely covered and are crucial for atmospheric modeling. The chapter on gas-phase pollutant capture builds upon topics covered in a good course in mass transfer. Perhaps for simplicity or brevity, the discussions of aerosols and the capture

of aerosol phase pollutants are almost exclusively limited to pre-existing spherical particles. Thus, particle formation and aggregation processes are omitted from an otherwise very good overview. The final chapter of the text presents cost analysis for pollution control equipment at a similar level of detail as in *Plant Design and Economics for Chemical Engineers* by M. S. Peters and K. D. Timmerhaus.

Several features of the book contribute to its utility as a course text. Each chapter has several example problems, a notation summary with fundamental dimensions provided, an excellent reference list, and roughly twenty problems ranging from simple questions about material in the text to design problems requiring numerical solutions. Problem solutions using MathCAD and other course materials are available on a Web site at <http://www.engr.psu.edu/cde/me470/>

Sources and Control of Air Pollution is very well suited to a one semester course for senior undergraduates. It makes use of material covered in several core chemical engineering courses and stresses the interdisciplinary nature of the field. Given the wide interest in environmental engineering among chemical engineering undergraduates, I suspect that a course based upon this text would be both popular and informative.

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