in the text than I had previously covered in the course. Apparently, however, the omission of this one chapter did not compensate for the addition of the open-ended problem. Therefore, care must be taken to ensure that the incorporation of a major open-ended problem is accompanied by the reduction of other assignments so that the students are not overloaded. Fortunately, the open-ended problem described in this paper is sufficiently flexible that it can be modified to suit an instructor's preferences and the time available in the course. For instance, the amount of student effort required can be reduced by providing literature data [5, 9-14] for the kinetics, specifying the desired concentration of organics in the effluent, or specifying a single organic pollutant in the wastewater stream rather than a multi-component mixture.

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H. Scott Fogler initiated the departmental effort to incorporate open-ended problems in the curriculum, and Brice Carnahan originally identified the *New York Times* article referenced in this paper as the basis for a problem in reaction engineering. Tom Thornton performed the literature search and obtained the kinetics data used in this open-ended problem.

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ChE **book review**

POLYMER CHEMISTRY: AN INTRODUCTION

(Second Edition)

Raymond B. Seymour and Charles E. Carraher, Jr.
Marcel Dekker, Inc., New York, 10016
720 pages, $45.00 (1988)

Reviewed by
William J. Koros
The University of Texas

This book is an updated version of a text which was first published some years ago by McGraw-Hill. This second edition comprises the eleventh volume in a series of undergraduate texts dealing with a broad range of topics in chemistry. As is pointed out in the forward to the book, written by Herman Mark, this new edition is quite up-to-date in terms of topical coverage, but without unnecessary complications. The book is easily read and has an almost conversational tone to it. One can imagine sitting across from the two authors (whose broad knowledge of polymer science is well-known) and having the book unfold in a casual, but still logical, fashion.

The revised text includes a number of new topics, and the authors note that the book meets the ACS guidelines for topical coverage in an introductory polymer chemistry course. A glossary and series of questions related to the material is given at the end of each chapter. The questions at the end of the chapter are a plus for the book since it is difficult to obtain good homework exercises in the polymer field without actually synthesizing them oneself. Nevertheless, while these exercises are useful, they are mostly discussable in nature and do not satisfy the persistent need for a really good compilation of computational problems to illustrate principles discussed in a polymer text.

As must be the case whenever one considers a wide range of topics and is committed to keeping the page-count within bounds, none of the topics is treated in any detail. The title, *Polymer Chemistry*, is not

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ideas into the modeling of chemical process systems.

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NOTATION

A_i	first jump moment
$\tilde{A}_{i,j}$	coefficient in expansion of $\tilde{A}_i$
B	concentration of component B
$B_{i,j}$	second jump moment
$\tilde{B}_{i,j}$	$B_{i,j}/\Omega$
$Cov[C_i, C_j]$	$\langle C_i C_j \rangle - \langle C_i \rangle \langle C_j \rangle$, covariance of C_i and C_j
C_f	feed concentration of component X_1
C_1	concentration of component X_1
C_2	concentration of component X_2
k_1, k_2	reaction rate constants
k_2'	reaction rate constant in units of molecules
$K_{i,j}(t)$	correlation matrix defined for C_i and C_j as $<C_i(0)C_j(\tau)>$ - $<C_i(0)>$ $<C_j(\tau)>$
N_A	Avogadro number
N_j	number of molecules of component j
$<N_i>$	expected value of random variable N_i
$W_t(\{n\}_0, \{n\}_1)$	rate of transition from state $\{n\}_0$ to state $\{n\}_1$

Greek Letters

ξ_i	magnitude of change in random variable N_i
τ_s	mean residence time
ϕ_i	deterministic variable corresponding to macroscopic behavior of N_i
Ω	system volume

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really descriptive since the authors seek to treat an extremely large fraction of *polymer science* rather than focussing on the narrower topic of *polymer chemistry*. It would be difficult to have included significant computational problems in the present text because the treatment is highly qualitative. Perhaps because of my chemical engineering bias, some actual examples worked out in detail would have been attractive. For example, condensation and free radical polymerization systems are important enough to merit such treatment even in an overview book such as this.

The references given at the end of the chapters are good, and, in fact, are some of the classics in the various areas. Most of the references are rather old, with only a sprinkling of new sources. While this is not a particular problem for an introductory text, it certainly does not reflect the current literature in a way needed for an introductory graduate (or even a more advanced undergraduate) course.

While the light, easily-read approach is ideal for many of the topics discussed in such an introductory text, some topics might have benefitted from a detailed treatment in order to give the student more than a broad-brush appreciation of their importance to the modern polymer field. It is likely that many instructors would feel the need to supplement the material in the areas of 1) polymer physical properties and their relationship to structure, 2) thermal methods of analysis (DSC,TGA, *etc.*), and 3) reaction kinetics for condensation and free radical systems. Alternatively, of course, one could direct the student to the original references given at the end of the chapters to obtain sufficient detail to have a true appreciation for these principles. If there is any topic which comes close to being missed, it is the important area of polymer-solvent and polymer-polymer thermodynamics. Although the topic of solubility of polymers in solvents is mentioned, the treatment and importance of solution thermodynamics is given practically no coverage.

The authors indicate that the book could be covered in a normal semester or in two quarter periods, and this seems reasonable. Even with supplemental information and exercises given in the areas noted above, the easily-read style and frequent use of drawings make the material easy to read and to understand. Even if some of the more technological topics covered in the last 40% of the book are not discussed in class, they make useful reading for a student seeking an overview of the field. ❐