BOOK REVIEWS

LADDHA (G. S.) and DEGELEESAN (T. E.): Transport Phenomena in Liquid Extraction: Pp. 490, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1976. Price: Rs. 25·80.

The authors have attempted, in this publication, to bring together in a single volume the extensive but scattered literature concerning the mechanics of liquid-liquid contact for the separation of single solutes. The arrangement of the material is logical starting from presentation of methods for experimental determination, prediction and correlation of equilibrium data to the eventual description, operating characteristics and mass transfer correlations in a variety of contacting equipment. Each contacting device is analysed in isolation with its own specific correlations. One would have liked to see a novel attempt in the application of similarity principles for an unified approach while treating different equipment design. I believe this objective was one of the many that have been proposed in the preface. The analysis of stagewise and differential behaviour of equipment for carrying out interphase transfer operation has been straightforward. An interesting chapter on drop dynamics has been incorporated. One would have liked to see a more detailed analysis of interfacial phenomena that plays a significant role in interphase transfer processes. In the section 7·5 dealing with mass transfer phenomenon during drop formation in which literature covered extends only upto 1966, in interesting and perhaps the first ever attempt in analog modelling of this phenomenon *via* cavity oscillations in TE_{101} mode in electrodynamics, has been omitted. This work was published in 1970.

A significant feature of this book pertains to the presentation of numerous correlations as aids to design. A disturbing and a rather annoying tendency exists in this exercise. I refer to the tendency in assigning to the exponents of dimensionless groups a number of four decimal place accuracy! notwithstanding the fact that the correlations are quite empirical in character and the numbers are frequently obtained by measuring the geometric slopes when experimental data are plotted in cartesean co-ordinates (*e.g.*, eqns. 6·29, 6·38, 6·39, 6·53, 6·54, 9·10). It is common knowledge that any exercise in dimensional analysis must stem from a very basic understanding of the underlying processes. A second observation concerns correlations in which a dimensionless group having a very small absolute magnitude say 10^{-2} is correlated against another having very large absolute magnitude, say 10^{+5} in which very large variation in the latter do not show up adequately in the former. This tendency to produce artificial association by enlarging the range of the product of several dimensionless groups is quite serious when it is required to estimate a basic parameter from a small valued group (Fig. 12·9). A third observation deals with the futility of representing correlations when none exists! (Fig. 15·3).

While the book deals almost exclusively with isothermal extraction phenomenon in the absence of chemical reactions, a small final chapter has dealt with the influence of chemical reaction on overall interphase transport rates. The analysis reported in chapter 15 draws heavily on concepts and equations developed for gas-liquid reacting systems without recognizing the role of a second liquid phase (source) in influencing interphase transport rates. In gas-liquid reacting systems, the logical assumption of the existence of a pure gas makes the analysis of the gas phase transfer step unnecessary. However, in liquid-liquid extractive reactions when a single solute is transferred from one liquid phase into another where it undergoes chemical combination with another solute present therein, the pure diffusional problem of the solute in the non-reacting phase exerts a pronounced influence on the overall transfer rates. The use of pure solute component is usually the exception rather than the rule. For example if solute A present is solvent 1 diffuses into another liquid where it undergoes a pseudo-first order reaction with the component B present, the model equations should consider the following:

$$\frac{\partial a^{I}}{\partial t} = D_{A}{}^{I}\,\frac{\partial^2 a^{I}}{\partial x^2}\,, \quad -\infty \leqslant X \leqslant 0 \tag{1}$$

$$\frac{\partial a^{II}}{\partial t} = D_{A}{}^{II}\,\frac{\partial^2 a^{II}}{\partial x^2} - k_2 B\,.\,a^{II} \tag{2}$$

In the solution of the above equations, two important boundary conditions have to be satisfied. These are:

At $X = 0$

$$D^{I}{}_{A}\,\frac{\partial a^{I}}{\partial x} + D^{II}{}_{A}\,\frac{\partial a^{II}}{\partial x} = 0 \tag{3}$$

$$a^{II*} = f(a^{I}) \qquad \text{(interfacial equilibrium)} \tag{4}$$

Therefore most of the statements and equations reported in chapter 15 are only very approximately valid.

The reviewer does not agree with the statement made under 15–1·2 to the effect that for first order processes if the residence time does not exceed t_r the reaction time, no reaction will take place. A little reflection would show that for $(k_1 t_r)$ to be unity, the appropriate conversion x_r can be given by:

$$x = (e - 1)/e = 0\cdot632$$

a very high conversion indeed. Even if $(k_1 t_r)$ is only 0·1, the conversion is 0·1.

Under 15–1·4 it is stated that the overall potential $(c - c_{AO})$ can be split into two parts to be "used-up" for the diffusion and reaction processes. While a gradient in concentration is necessary for the diffusion process, it is not required for a chemical transformation process. In the basic conservation equation they appear as:

$D_A \cdot dc/dx$ and $k_r \cdot c$. In fact by eliminating c^1 from equations 15·9 and 15·10, the overall transfer rate can be given by:

$$N_A = \frac{V(C^* - C_{A0})}{\left(\frac{1}{k_L a} + \frac{1}{k_2 B}\right)} \tag{5}$$

from which simplified equations like 15.14 and 15·18 may be derived based on the relative numerical magnitude of the terms in the denominator. Notwithstanding the above the reviewer cannot reconcile himself to the form of eq. 15·10 for describing a second order rate expression.

In section on Instantaneous Reactions, 15–1·6, Figure: 15·2 (*a*) is drawn for concentration profiles of species A and B. The profile for A is shown as a straight line, which is not correct, Equations 15·44 and 15·45 are wrongly written. The RHS terms should read as: $(\partial^2 C_A/\partial x^2)$; $(\partial^2 C_B/\partial x^2)$.

The overall impression that one gets in reading through chapter 15 is that it has been written in haste without giving due considerations in the analysis for the presence of a source phase in which the solute to be eventually immobilized in a second phase is present in small concentration. Therefore all the correlating equations listed under Table 15·1 are in serious doubt unless one can conclusively prove by mathematical arguments that transport processes in the source phase are immaterial. A very serious criticism that the reviewer can raise on all contemporary research dealing with modelling strategies based on penetration theory is that a finite maximum age is specified for the liquid elements on the interface. A little reflection would show that the mechanism of surface renewal is random in character and that the age distribution function is *continuous* and exists from zero to infinity. A consequence of this distribution function is that all the four absorption regimes right from pure absorption to instantaneous reaction exist *simultaneously*. There is nothing like a control regime !

In trying to sum up one's critical impression after reading through the text, a few features stand out prominently. For example, the absence of any treatment concerning heat effects, inadequate treatment from the point of view of hydrodynamics and finally a heavy emphasis on mass transfer correlations specific for contacting equipment based on macroscopic treatment of the transfer phenomenon. Chapter 15 has been written in haste and the need for major revision is necessary. These would make one wonder as to what extent the main objective set forth in the preface but the authors, to wit: " present a unified approach to the understanding and interpretation data" has been realized. Further the title is rather in inappropriate considering the contents. One could replace it by " Mass Transfer in Liquid Extraction ".

The book may be recommended for additional reading for undergraduate students taking a course on " Equilibrium Stage Processes ". The reviewer is not so sure that it may fulfil the needs of a graduate student.

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IYENGAR (T. K. S.): New Dimensions in Library Science; Pp. 210, Allied Publishers Pvt. Ltd., New Delhi, 1976. Price: Rs. 45·00.

NEW DIMENSIONS IN LIBRARY SCIENCE is a unique type of book which reflects the inter-disciplinary nature of library science. The book has a practical approach with lot of data, statistics and case studies incorporated within it.

The book starts with discussing the new dimensions in library education, role of academic libraries and impact of libraries on Society and Technology.

The emphasis on the technological achievements in the field of library/ information science from the concept of book as a physical object to the present trend of storing data and information on computer for relevant retrieval are anālysed and discussed. The coverage of the basic principles and their projection to the new dimensions reflects as the Author points out " to the developments and extensions of interests and practical applicability to the teachers in library education and library administrators ".

The effect of information explosion and its organisation and handling by the present-day techniques has a bearing on the education for librarianship. The dichotomy in library education and its interdisciplinary nature are discussed in the context of the computer and communication technology and a thorough rethinking on the present-day courses taught in the library schools are indicated.

Several statistical projections are given on the future of India's academic and scientific libraries. Application of Computer technology for library problems are presented with numerous examples and mechanics.

The book will be a valuable addition to all scientific and academic libraries to solve practical problems faced by many organizations.

The book has relevance to India's future role on library and information science with a number of projections and data supplied.

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Calendar of events: Conferences/Symposia at the Indian Institute of Science Campus

Sl. No.	Name	Period	Sponsoring Department of the Institute
1.	Winter School in Engineering Applications on Lasers and Laser Systems	18 October to 1 November 1976	Central Instruments and Services Laboratory
2.	Intensive Course on Design and Technology of Digital Equipment	21 November to 4 December 1976	Electrical Communication Engineering
3.	Hybrid Simulation and Industrial Process System Design	22 November to 8 December 1976	School of Automation
4.	Symposium on Vitamin and Carrier Function of Polyprenoids	9–11 December 1976	Biochemistry
5.	6th All-India Symposium on Biomedical Engineering	14–16 December 1976	Biomedical Engineering Group (I.I.Sc.)
6.	Silver Jubilee Celebrations of the Department of Chemical Engineering	20–24 December 1976	Chemical Engineering

On the basis of the information received by the Editorial Office on 15th November 1976.