Kinetics and Mechanisms of Chemical Transformations, J. Rajaram and J. C. Kuriacose. Macmillan India Ltd., New Delhi 110 002. 1993. Price: Rs 77. 872 pp.

The authors have done a tremendous job in providing a very broad coverage of the field of dynamics of reactions and trying to remove the difficulties students often face when learning chemical kinetics. No textbook on kinetics and mechanisms has, to the reviewer's knowledge, covered so many different areas as the present text.

Chapter I is a conventional presentation except that the authors have referred to the modes of activation and the progress of a reaction in a flow system. Not much would have been sacrificed by leaving out the discussion of order and molecularity. Simple reactions with analysis of kinetic data have been discussed in Chapter II and the experimental methods in Chapter III. The presentation is excellent with well-chosen worked out examples. Chapter IV is devoted to the discussion of complex reactions, again with the help of numerous worked out problems. In Chapter V, the effect of temperature on the rates of reactions has been discussed. The elaboration of energy of activation E_a merits special appreciation. The authors have very lucidly explained with examples, how to interpret the observed energy of activation, an aspect which many research workers pay scant attention to.

The theories of reaction rates have been discussed in great detail in Chapter VI. Chapter VII is a discussion on rate laws and mechanisms with numerous chosen examples. While discussing the isokinetic plot (ΔH vs ΔS), the authors say that the values of ΔS and ΔH are subject to large errors, and to make it worse, the errors are mutually dependent because of the method of calculation. The reviewer is happy to note this critical appreciation.

Reactions in solution are discussed in Chapter VIII. In the assessment of linear free energy relationship, the authors could have offered a more critical appreciation as has been done in the case of the isokinetic plot.

Reactions of chemical species in the excited states are considered in Chapter IX. Worked out problems have been very well chosen. Different types of organic reactions such as photofragmentation, photorearrangement, photodimerization and photochemical redox reactions have been discussed. Photoelectrochemistry, radiation chemistry and radiolysis of water have been touched upon.

Two long chapters X and XI deal with homogeneous and heterogeneous catalysis. The kinetics of enzyme-catalysed reactions have been presented in detail with a number of worked out problems. Reactions in micellar media and phase transfer catalysis have also been discussed. These chapters are very well written and provide a clear and comprehensive view of the topics.

Reactions with solid reactants have been discussed in Chapter XII. These reactions include many processes that are of great industrial importance. Various aspects of these reactions have been considered and numerical problems worked out to clarify the theoretical principles. Thermogravimetric studies have been described with examples. This chapter has a number of complicated equations, some of which suffer from typographical mistakes.

Chapter XIII presents electrode kinetics. Figure 13 presents different models proposed for the so-called double layer from time to time. For the final model (Bockris–Devanathan–Muller), the specific absorption of highly polarizable negative ion would have been better depicted had the authors used the picture that Bockris–Reddy's text provides, where the electrode has been shown to have negative charge. Voltammetric techniques for studying reaction mechanisms have been described.

A discussion on rapid reactions in solution is given in Chapter XIV. The relaxation techniques which the authors touch upon in this chapter deserve more detailed treatment.

In the last chapter comes the application of chemical kinetics in the elucidation of mechanisms of a few typical reactions. Reactions of organic compounds have been treated first and then the reactions of coordination compounds. Calculations connected with electron transfer processes have been presented to illustrate the application of the Marcus correlation. By way of illustration of the application of the methods of chemical kinetics, the authors have discussed oscillatory chemical reactions and polymerization reactions. The concept of steady state approximation as well as the effect of temperature and pressure on chain reactions explained very clearly in Chapter IV have been illustrated with examples in this chapter.

The authors in their preface have stated that they are attempting to remove the difficulties experienced by students in understanding and applying the principles of chemical kinetics. On the whole, the authors have succeeded in their objective by the very clear presentation, their anticipation of the questions that may arise in the mind of the student, and the presentation of numerical problems right on the trial of the theoretical treatment. The book is really a great achievement in that it presents practically every area of the application of chemical dynamics excepting probably the photoinitiated redox reaction. Bibliography at the end of each chapter would be better than all clubbed together at the end. In addition to text books and treatises, references to review articles and also articles in Journals like *Journal of Chemical Education* could have been included.

Despite some of these drawbacks, this is an excellent book which should be in the hands of every student of chemistry, research worker and teacher. The book will serve as a source book on chemical kinetics and mechanisms to beginners as well as practitioners in the field.

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Synchrotron Radiation Crystallography, by Philip Coppens. Academic Press, 24–28, Oval Road, London NW1 7DX. 1993. Price: $45.

Conventional X-ray diffraction crystallography is carried out using characteristic radiation emitted by a metal target excited by an energetic electron beam. Availability of computer-controlled diffractometers that locate directions of diffracted beams and measure the associated intensities with great precision and developments of powerful methods of automated structure determination for

crystals of small organic molecules have made crystal structure determination an automated routine technique.

Crystallographic studies have opened up the flodgates for understanding atomic details of physical, chemical and biological phenomena. Crystallographic science has greatly benefitted by developments of techniques in other areas of physics, chemistry and biology. Use of synchrotron radiation for structural studies is one of the latest of these developments.

The book on synchrotron radiation crystallography by Philip Coppens covers most of the important aspects of these developments and provides extensive references to relevant literature. All the chapters in the book reflect the ability of the author to present theoretical arguments as well as experimental techniques with simplicity and a sense of wonder. The introductory chapters present a lucid description of the characteristics of synchrotron radiation such as flux, brilliance and brightness and identify the broad areas of investigations for which the new radiation sources are important. The illustrations in all the chapters are excellent. The optical elements that are inserted in the beam path to obtain an X-ray beam of desired monochromaticity and spatial divergence and various aspects of beam characteristics and their relation to errors of measurements are well described. Some description of area detectors, including the recently developed imaging plate systems, multiwire proportional chambers and charge coupled devices are provided along with references to original literature.

The usefulness of the synchrotron beams for studies on charge densities is illustrated with some pioneering first applications to inorganic complexes. This part also has a discussion on factors that contribute to the accuracy of the final maps and a discussion on the protocols to minimize errors. Theoretical analysis of the anomalous scattering effects that could be exploited by the tuneability of the wavelength of synchrotron radiation is presented along with the methods for experimental estimation of the real and imaginary components of anomalous scattering. There is also a brief discussion on the applications to biological macromolecules. Aspects of studies on time-resolved structural studies in the case of organic molecules as well as proteins have become possible only due to the high intensity of the synchrotron beam. The high intensity over a broad wavelength range in synchrotron radiation makes new multiwavelength methods available for structural studies. This is briefly covered with references to recent work on high pressure studies and macromolecular crystallography. The book also has review chapters on high resolution powder diffraction methods (the so-called Rietveld refinement) found indispensible for certain types of analysis in material science (by D. E. Cox of Brookhaven National Laboratory) and thin film or two-dimensional crystallography (by E. Vliey and I. K. Robinson, AT&T Bell Laboratories). The book presents a concise account of the fascinating and rapid developments that are taking place in the use of synchrotron radiation in structural science.

The book will be a standard source of reference for all crystallographers and material scientists interested in using the powerful beam available in synchrotrons. Although this book has found its way into the hands of this reviewer nearly 2 years after publication, the contents have not lost any of their topicality. It might not be irrelevant to mention here that India will acquire a synchrotron of its own and will have X-ray beam line available during the first decade of the next century.

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Correction

In "The centennial of the discovery of millimetre waves by Jagadis Chandra Bose" (*Curr. Sci.*, 1996, **70**, 172–175), read "In May *1895...*" instead of "*...1885...*" on page 172, 1st line and "Another statement about Bose's *prowess...*" instead of "*...process...*" on page 175, column 3, 35th line.