

Foreword

There have been many changes of plan during the evolution of this first volume of *Specialist Periodical Reports* on Reaction Kinetics. As emphasised vividly by Professor Benson in the first chapter, chemical kinetics has ceased to be a small, self-contained section of physical chemistry, and is now of great influence in chemical engineering, in all branches of chemistry, and in biochemistry, as well as providing a basic tool for exploring the mechanisms of chemical reactions. It is not surprising, therefore, that preliminary searches and enquiries revealed that a good deal of current research on the rates of reactions is (or will be) reviewed in published or planned volumes of other *Specialist Periodical Reports* titles. Many aspects of recent work on reactions in solution, on photochemical reactions, and on surface reactions are covered in this way. The logical reason for another SPR title, specifically on reaction kinetics, is to give systematic reviews of progress in theoretical and experimental work on the rates of elementary reactions, especially in the gas phase, and to report on advances in modelling combinations of elementary processes to give the best description of macroscopic rates in various phases or at their interfaces. Unfortunately, in all these investigations we are far beyond the emergence of the grand basic ideas that altered the whole approach to the subject – ideas linked inescapably with the work of, *inter alia*, Guldberg and Waage and Arrhenius on rate expressions; of McC. Lewis and Lindemann on collision and unimolecular theories; of Eyring and Polanyi on transition-state theory; of Bodenstein and Semenov on chain reactions; and of Langmuir and Taylor on surface reactions. Our efforts to understand and control the factors that affect rates of reaction have diverged, and in both theory and experiment we have (to quote Benson) ‘ specialists and-sub-specialists and mission-oriented kineticists ’ It was clear from the start that there could not be a single theme, even for one volume. However, it was necessary to decide whether each article should be addressed only to its own practitioners, or be attractive and intelligible to those working in other kinetic studies. I have chosen the second plan, and I hope that the resulting mixture will appeal to a fairly wide audience. After the introductory chapter, the articles fall into two groups. Chapters 2–5 consist of critical reviews of rate data for particular kinds of reaction, with emphasis on the current methods used to determine rate constants, and their Arrhenius parameters, mainly for reactions in the gas phase. The second group, chapters 6–8, contains three essays on recent treatments of sets of elementary reactions, two being oriented towards explaining particular rate phenomenon and the other dealing with modelling in general. Unfortunately, but inevitably, some important aspects of kinetic studies have not been covered in this volume.

There is no systematic review of work on rates in solution, but this is fortunately compensated by an article in the *Annual Reports for 1973* (Section A), and another article there deals with recent extensive work on catalysis by oxides; other articles on the kinetics of surface reactions have appeared in the *Specialist Periodical Reports on Surface and Defect Properties of Solids*. However, it is hoped to cover certain aspects of researches on heterogeneous catalysis and on solution kinetics in the future volumes, and also to cover in more detail some theoretical treatments of elementary processes. Serious proposals for contributions on these or other topics for future volumes, to be published at approximately two-yearly intervals, will be very welcome.

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