Kinetics of Ion-Molecule Reactions

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Preface

The investigation of the elementary reactions of reactive intermediate species began about half a century ago with the advent of free radical kinetics as an active area of chemical research. In spite of the relatively greater ease of detection of a species carrying an electrical charge, and the fact that organic chemists had for decades postulated mechanisms involving ionic intermediates, the systematic study of the elementary reactions of ions was delayed for more than twenty years after the first beginnings of free radical kinetics. Even at this writing, in 1978, the word "kinetics" is considered by many chemists to be synonymous with "kinetics of neutral species".

Yet in spite of the relatively late start and separation from the mainstream of kinetics, the field of ion physics and chemistry is flourishing, and growing at an ever faster pace. Instrumentalists devise ever more sophisticated apparatuses with capabilities of delving into nearly every aspect of the interactions between ions and molecules. Even satellites orbiting the earth are now being used effectively to determine rate coefficients of ionospheric ion-neutral reactions, some of which can not as yet be measured in the laboratory.

This book contains discussions of some of these new experimental approaches and the resulting knowledge which has been acquired since the earlier 1974 NATO Advanced Study Institute on Interactions between Ions and Molecules, which was held in Biarritz, France. Besides the more fundamental aspects of ion kinetics and the characterization of ions with regard to structure and energy, ionic processes occurring in interstellar space, the earth's atmosphere, lasers, and combustion, are discussed here. In addition, readers will find chapters describing nucleation phenomena and the relationships between ionic processes occurring in the gas and liquid phases.

I would like to express my appreciation to everyone who contributed to the success of the NATO Advanced Study Institute on Kinetics of Ion-Molecule Reactions held at La Baule, France, in

September, 1978. This includes not only all of the lecturers, those who contributed to the discussion panels, and those who chaired the sessions, but, just as important, all of those in attendance whose interest and enthusiasm contributed to the stimulating atmosphere of the Institute. I would also like to give recognition to the efforts of the members of the Organizing Committee Rose Marx, Sharon Lias, Keith Jennings, Paul Kebarle, Eldon Ferguson, and especially Tom Govers, who was largely responsible for the smooth functioning of the physical details of the meeting. On behalf of all participants, I would like to thank the Scientific Affairs Division of the North Atlantic Treaty Organization without whose financial assistance the occurrence of such a constructive summer school would not have been possible. I personally would like particularly to acknowledge the moral support supplied by the secretary of the Scientific Affairs Division, Dr. Tilo Kester. We also thank the National Science Foundation of the U.S.A. for travel grants.

P. Ausloos
Washington, DC
November, 1978

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