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978-0-521-82819-2 - Dissociative Recombination of Molecular Ions
Mats Larsson and Ann E. Orel
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DISSOCIATIVE RECOMBINATION OF MOLECULAR IONS

Dissociative recombination (DR) of molecular ions with electrons is a complex, poorly understood molecular process. Its critical role as a neutralizing agent in the Earth's upper atmosphere is now well established and its occurrence in many natural and laboratory produced plasmas has been a strong motivation for studying the event. For the first time, theoretical concepts, experimental methodology, and applications are united in one book, revealing the governing principles behind the gas-phase reaction. The book takes the reader through the intellectual challenges posed, describing in detail dissociation mechanisms, dynamics, diatomic and polyatomic ions, and related processes, including dissociative excitation, ionpair formation and photodissociation. With the final chapter dedicated to applications in astrophysics, atmospheric science, plasma physics, and fusion research, this is a focused, definitive guide to a fundamental molecular process. The book will appeal to academics within physics, physical chemistry, and related sciences.

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We would like to dedicate this book to Sheldon Datz, who was responsible for introducing us to this interesting area of physics.

Contents

<i>Preface</i>	<i>page</i> ix
Introduction	1
1.1 History 1900–1950	1
1.2 History 1950–1970	5
1.3 History 1970–1990	7
1.4 History 1990–present	10
2 Experimental methods	11
2.1 Merged beams	11
2.2 Ion storage rings	30
2.3 Stationary afterglow technique	51
2.4 Flowing afterglow technique	59
2.5 Shock-tube technique	68
3 Theoretical methods	70
3.1 Introduction	70
3.2 What is a resonance?	75
3.3 Formal resonance theory	78
3.4 Resonance parameters and structure	83
3.5 Nonadiabatic couplings	89
3.6 Calculation of dynamics	93
4 The H_2^+ molecule	104
5 Diatomic hydride ions	119
5.1 HeH^+	119
5.2 NeH^+ , ArH^+ , KrH^+ , and XeH^+	132
5.3 CH^+	133
5.4 NH^+ and OH^+	139
5.5 LiH^+	140

viii	<i>Contents</i>	
6	Diatomic ions	143
6.1	Rare-gas dimer ions: He_2^+ , Ne_2^+ , Ar_2^+ , Kr_2^+ , Xe_2^+	143
6.2	The atmospheric ions: O_2^+ , N_2^+ , and NO^+	154
6.3	Other diatomic ions	180
7	The H_3^+ molecule	184
7.1	History of H_3^+	184
7.2	The dissociative recombination of H_3^+	186
8	Polyatomic ions	227
8.1	Dissociation dynamics in recombination of XH_2^+ ions ($X = \text{C}, \text{N}, \text{O}, \text{S}, \text{P}$)	227
8.2	Astrophysical molecular ions	244
8.3	Cluster ions	267
8.4	Hydrocarbon ions	277
8.5	Other polyatomic ions	283
8.6	Electron capture dissociation	283
9	Related processes	287
9.1	Dissociative excitation and ionization of molecular ions	288
9.2	Ion-pair production	294
9.3	Electron impact detachment of negative ions	296
9.4	Electron–molecule scattering; dissociative attachment	300
9.5	Photodissociation and photoionization	308
10	Applications	315
10.1	Molecular astrophysics	315
10.2	Atmospheric physics and chemistry	319
10.3	Plasma physics and fusion research	320
	<i>References</i>	321
	<i>Index</i>	377

Preface

This research monograph provides a single-volume description of the dissociative recombination of molecular ions with electrons. Since this is one of the most complex gas-phase processes, its study is a challenge to theorists and experimentalists alike. The theory, experiment, and applications of dissociative recombination are scattered in the scientific literature as original research articles, conference proceedings, and review articles. This book brings this information together in a single work for the first time.

The book is intended for researchers and Ph.D. students in the fields of atomic and molecular physics, chemical physics and physical chemistry, molecular astrophysics, atmospheric physics, and other areas of science where electrons and molecular ions are important.

This book was written during a period when each of us had several other commitments which slowed down the writing. One of us (AEO) was department chair at UC Davis essentially during the entire writing process, and ML chaired committees for the Swedish Space Board and the Swedish Research Council.

We are grateful for the hospitality of the Institute for Atomic and Molecular Physics (ITAMP) at the Harvard-Smithsonian Center for Astrophysics and Harvard University Physics Department (Kate Kirby, Hussein Sadeghpour), the Cluster Research Laboratory, Toyota Technological Institute, Tokyo (Tamotsu Kondow), and the University of Chicago (Takeshi Oka), all of which provided excellent working conditions for us when we needed to get away from our home institutions to focus on writing.

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