

Preface

Vibrationally mediated photodissociation (VMP) deals with the influence of vibrational excitation of the ground electronic state of a molecule on its dissociation following excitation of this state to a higher electronic state. VMP studies were initially motivated by the prospect of enhancing the photodissociation cross section as a result of vibrational pre-excitation. However, more recently the main interest in VMP has been driven by the hope that by preparing some specific vibrational levels rather than others, the subsequent dissociation of the electronically excited molecule could be controlled. In other words, the goal of achieving so-called “mode-selective” or “bond-selective” dissociation has been at the heart of VMP studies. Obviously, for this goal the molecule should have at least two vibrational modes. Therefore, the focus of VMP studies has been on triatomic or larger molecules.

The scope of this monograph is to present the methodology of VMP *via* state-of-the-art specific examples. Overviews of earlier works are included as well, to serve as a background for current research. The presentation deals with “isolated” neutral molecules in the gas phase; VMP in complexes, clusters or condensed phases is not discussed. Wherever appropriate, original studies are quoted, including the original drawings. It is hoped that from the description of the motivation, the approach, the execution of the experiment and the analysis of the results of the specific examples, the reader will get a comprehensive understanding of the field. In addition, a general introduction and summary should give the necessary orientation before and after plunging into details. The limited length of the monograph imposes selection of only a limited number of examples from the extensive literature dealing with VMP that could be discussed, but an effort has been made to give references to as many studies as we were aware of. We apologize for any possible oversights.

The level of presentation is appropriate for senior undergraduate and graduate students of chemistry and physics. It is hoped that the monograph will serve as an introduction to VMP for beginners and as a literature guide to those acquainted with the subject but not necessarily working on VMP. Obviously, in

a monograph of limited length, very detailed explanations of the experimental and theoretical methods involved in VMP could not always be included; however, references to original studies are presented at the end of each chapter and should help readers who are interested in more details.

I would like to thank the students of our laboratory and colleagues all over the world for their learned input *via* very many discussions we have had in meetings and through the mail. During the writing of the monograph I have contacted many authors of the papers cited in the monograph and I apologize for not mentioning them all, since a full list would include tens of names. I would still like to mention those whose help has been particularly extensive, our graduate and postgraduate students Amir Golan, Chen Levi, Ran Marom and Alex Portnov and my friends and colleagues Ilana Bar, who also deserves most of the credit for the VMP work conducted in our laboratory, Paul Dagdigian, Aryeh Levin and Moshe Shapiro. Last but not least, I am greatly indebted to the members of my family, whose names I am not mentioning at their request. Without their support and patience, this monograph would not have been written.

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