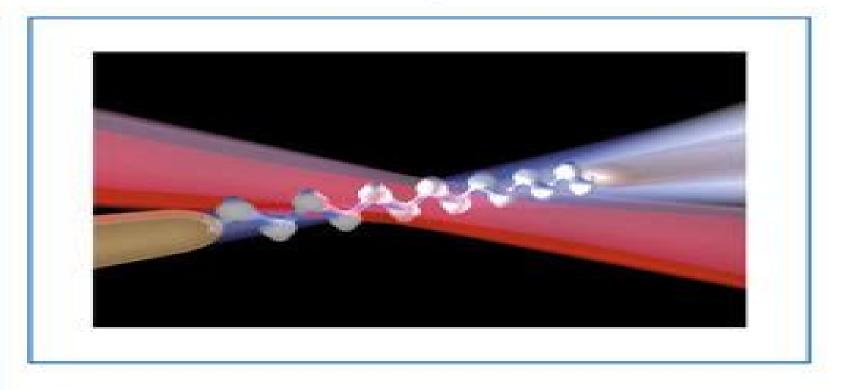
# Quantum Control of Molecular Processes

Second, Revised and Enlarged Edition



# **Quantum Control Of Molecular Processes**

**Moshe Shapiro, Paul Brumer** 

#### **Quantum Control Of Molecular Processes:**

Quantum Control of Molecular Processes Moshe Shapiro, Paul Brumer, 2012-09-19 Written by two of the world's leading researchers in the field this is a systematic introduction to the fundamental principles of coherent control and to the underlying physics and chemistry This fully updated second edition is enhanced by 80% and covers the latest techniques and applications including nanostructures attosecond processes optical control of chirality and weak and strong field quantum control Developments and challenges in decoherence sensitive condensed phase control as well as in bimolecular control are clearly described Indispensable for atomic molecular and chemical physicists physical chemists materials scientists and nanotechnologists

Quantum control of molecular processes in the K2 molecule Dana Mastrovito, 1998

Principles of the Quantum Control of Molecular Processes Moshe Shapiro, Paul Brumer, 2003 Principles and Applications of Quantum Contro Over the past fifteen years significant developments have been made in utilizing quantum attributes of light and matter to assume unprecedented control over the dynamics of atomic and molecular systems This growth reflects a confluence of factors including the maturation of quantum mechanics as a tool for chemistry and physics the development of new laser devices increasing our ability to manipulate light and the recognition that coherent laser light can be used to imprint information on atoms and molecules for practical purposes Written by two of the world's leading researchers in the field Principles of the Quantum Control of Molecular Processes offers a systematic introduction to the fundamental principles of coherent control and to the physics and chemistry necessary to master it Designed as both a resource for self study and as a graduate textbook this survey of the subject provides a step by step discussion of light matter interactions along with coverage of such essential topics as Molecular dynamics and control LI The dynamics of photodissociation LI Bimolecular collision processes LI The control of chirality and asymmetric synthesis LI Application of control using moderate and strong fields LI Tuning the system and laser parameters to achieve optimal control LI Decoherence and methods for countering it P Both authoritative and comprehensive this first in depth treatment of coherent control is destined to become the standard reference in an increasingly influential field PAUL W BRUMER PhD is University Professor Theoretical Chemical Physics and holds the Roel Buck Chair in Chemical Physics at the University of Toronto He received his BSc from Brooklyn College and his PhD from Harvard University MOSHE SHAPIRO PhD is the Jacques Mimran Professor of Chemical Physics at the Weizmann Institute of Science Rehovot Israel and a Professor of Chemistry and Physics at the University of British Columbia He received his BSc MSc and PhD from the Hebrew University of Jerusalem The authors are among the cofounders of the field of coherent control They have published extensively on this and related subjects in chemical physics and have received numerous awards and worldwide recognition for their research contributions **Electronic And Nuclear Dynamics In** Molecular Systems Yuichi Fujimura, Hirofumi Sakai, 2011-06-20 In recent years there has been rapid growth in the research field of real time observation of nuclear and electronic dynamics in molecules Its time range extends from femtoseconds to

attoseconds This has been made possible by the development of both laser technology and time dependent theoretical treatments Indeed this research field is arguably the most active one in molecular science second only to femtosecond chemistry The outcome of the research is expected to make an important contribution to physics materials science and biology as well as chemistry In this monograph the fundamental theories and methods as well as experimental methods and results of real time observation of both nuclear and electronic motions in molecular systems are described It is suitable for researchers who want to make an active contribution to the new research field and for graduate students who are interested in ultra fast nuclear and electron dynamics in molecular systems Femtochemistry: Ultrafast Chemical And Physical Processes In Molecular Systems Majed Cherqui, 1996-04-30 This book highlights the latest experimental and theoretical developments in the field of femtochemistry with papers describing the physics and chemistry of ultrafast processes in small molecules complex molecular systems clusters biological systems solids matrices liquids and at surfaces and interfaces The recent developments in frequency domain studies of femtodynamics are also presented In addition the latest achievements in femtosecond control of chemical reactions are presented together with the newest techniques in real time probing of reactions such as ultrafast x ray or electron diffraction The papers are rich in references giving a clearcut state of the art of the topics being discussed The book should be a valuable tool to all persons in the field and to young scientists Contributors include A H Zewail J Jortner V S Letokhov J Manz R S Berry C Wittig K B Eisenthal A W Castleman Jr J T Hynes W H Gadzuk R Kosloff S Mukamel K R Wilson G Fleming D Wiersma K Yoshihara V Sundstr m A Apkarian N Scherer A Myers R Schinke J R Huber R B Gerber G Gerber and P M Champion Charge and Energy Transfer Dynamics in Molecular Systems Volkhard May, Oliver Kühn, 2011-04-27 This 3rd edition has been expanded and updated to account for recent developments while new illustrative examples as well as an enlarged reference list have also been added It naturally retains the successful concept of its predecessors in presenting a unified perspective on molecular charge and energy transfer processes thus bridging the regimes of coherent and dissipative dynamics and establishing a connection between classic rate theories and modern treatments of ultrafast phenomena Among the new topics are Time dependent density functional theory Heterogeneous electron transfer e g between molecules and metal or semiconductor surfaces Current flows through a single molecule While serving as an introduction for graduate students and researchers this is equally must have reading for theoreticians and experimentalists as well as an aid to interpreting experimental data and accessing the original literature Modeling and Control for Micro/Nano Devices and Systems Ning Xi, Mingjun Zhang, Guangyong Li, 2017-12-19 Micro nano scale engineering especially the design and implementation of ultra fast and ultra scale energy devices sensors and cellular and molecular systems remains a daunting challenge Modeling and control has played an essential role in many technological breakthroughs throughout the course of history Therefore the need for a practical guide to modeling and control for micro nano scale devices and systems has emerged The first edited volume to address this rapidly growing field Modeling and

Control for Micro Nano Devices and Systems gives control engineers lab managers high tech researchers and graduate students easy access to the expert contributors cutting edge knowledge of micro nanotechnology energy and bio systems The editors offer an integrated view from theory to practice covering diverse topics ranging from micro nano scale sensors to energy devices and control of biology systems in cellular and molecular levels The book also features numerous case studies for modeling of micro nano devices and systems and explains how the models can be used for control and optimization purposes Readers benefit from learning the latest modeling techniques for micro nano scale devices and systems and then applying those techniques to their own research and development efforts Advances in Chemical Physics, Volume 159 Paul Brumer, 2016-03-31 This volume of Advances in Chemical Physics is dedicated by the contributors to Moshe Shapiro formerly Canada Research Chair in Quantum Control in the Department of Chemistry at the University of British Columbia and Jacques Mimran Professor of Chemical Physics at the Weizmann Institute who passed away on December 3 2013 It focuses primarily on the interaction of light with molecules one of Moshe's longstanding scientific loves However the wide range of topics covered in this volume constitutes but a small part of Moshe s vast range of scientific interests which are well documented in over 300 research publications and two books **Essential Computational Modeling in Chemistry** Philippe G. Ciarlet, 2010-12-07 Essential Computational Modeling in Chemistry presents key contributions selected from the volume in the Handbook of Numerical Analysis Computational Modeling in Chemistry Vol 10 2005 Computational Modeling is an active field of scientific computing at the crossroads between Physics Chemistry Applied Mathematics and Computer Science Sophisticated mathematical models are increasingly complex and extensive computer simulations are on the rise Numerical Analysis and scientific software have emerged as essential steps for validating mathematical models and simulations based on these models This guide provides a guick reference of computational methods for use in understanding chemical reactions and how to control them By demonstrating various computational methods in research scientists can predict such things as molecular properties. The reference offers a number of techniques and the numerical analysis needed to perform rigorously founded computations Various viewpoints of methods and applications are available for researchers to chose and experiment with Numerical analysis and open problems is useful for experimentation Most commonly used models and techniques for the molecular case is quickly accessible **Computational Chemistry** Philippe G. Ciarlet, Jacques-Louis Lions, 1990 Aiming to provide the reader with a general overview of the mathematical and numerical techniques used for the simulation of matter at the microscopic scale this book lays the emphasis on the numerics but modelling aspects are also addressed The contributors come from different scientific communities physics theoretical chemistry mathematical analysis stochastic analysis numerical analysis and the text should be suitable for graduate students in mathematics sciences and engineering and technology

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