


SPRINGER BRIEFS IN PHYSICS

Vladimir G. Plekhanov

# Isotope-Based Quantum Information

 Springer

# Isotope Based Quantum Information Springerbriefs In Physics

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## **Isotope Based Quantum Information Springerbriefs In Physics:**

**Isotope-Based Quantum Information** Vladimir G. Plekhanov, 2012-05-26 The present book provides to the main ideas and techniques of the rapid progressing field of quantum information and quantum computation using isotope mixed materials It starts with an introduction to the isotope physics and then describes of the isotope based quantum information and quantum computation The ability to manipulate and control electron and or nucleus spin in semiconductor devices provides a new route to expand the capabilities of inorganic semiconductor based electronics and to design innovative devices with potential application in quantum computing One of the major challenges towards these objectives is to develop semiconductor based systems and architectures in which the spatial distribution of spins and their properties can be controlled For instance to eliminate electron spin decoherence resulting from hyperfine interaction due to nuclear spin background isotopically controlled devices are needed i e nuclear spin depleted In other emerging concepts the control of the spatial distribution of isotopes with nuclear spins is a prerequisite to implement the quantum bits or qbits Therefore stable semiconductor isotopes are important elements in the development of solid state quantum information There are not only different algorithms of quantum computation discussed but also the different models of quantum computers are presented With numerous illustrations this small book is of great interest for undergraduate students taking courses in mesoscopic physics or nanoelectronics as well as quantum information and academic and industrial researches working in this field

*Isotope Low-Dimensional Structures* Vladimir G. Plekhanov, 2012-05-08 This Briefs volume describes the properties and structure of elementary excitations in isotope low dimensional structures Without assuming prior knowledge of quantum physics the present book provides the basic knowledge needed to understand the recent developments in the sub disciplines of nanoscience isotopetronics novel device concepts and materials for nanotechnology It is the first and comprehensive interdisciplinary account of the newly developed scientific discipline isotopetronics

**Isotopes in Condensed Matter** Vladimir G. Plekhanov, 2012-08-10 This book provides a concise introduction to the newly created sub discipline of solid state physics isotopetronics The role of isotopes in materials and their properties are describe in this book The problem of the enigma of the atomic mass in microphysics is briefly discussed The range of the applications of isotopes is wide from biochemical process in living organisms to modern technical applications in quantum information Isotopetronics promises to improve nanoelectronic and optoelectronic devices With numerous illustrations this book is useful to researchers engineers and graduate students

**Isotope Effects in Solid State Physics** ,2000-10-24 Since its inception in 1966 the series of numbered volumes known as Semiconductors and Semimetals has distinguished itself through the careful selection of well known authors editors and contributors The Willardson and Beer series as it is widely known has succeeded in producing numerous landmark volumes and chapters Not only did many of these volumes make an impact at the time of their publication but they continue to be well cited years after their original release Recently Professor Eicke R Weber of the

University of California at Berkeley joined as a co editor of the series Professor Weber a well known expert in the field of semiconductor materials will further contribute to continuing the series tradition of publishing timely highly relevant and long impacting volumes Some of the recent volumes such as Hydrogen in Semiconductors Imperfections in III V Materials Epitaxial Microstructures High Speed Heterostructure Devices Oxygen in Silicon and others promise that this tradition will be maintained and even expanded Reflecting the truly interdisciplinary nature of the field that the series covers the volumes in Semiconductors and Semimetals have been and will continue to be of great interest to physicists chemists materials scientists and device engineers in modern industry First book on the extremely fashionable subject Adopts an original approach to the subject Timely book in a field making significant progress Introduces new optical tools for solid state physics with wide technological potential Important applications are to be expected for information storage isotopic fiber optics and tunable solid state lasers isotopic optoelectronics as well as neutron transmutation doping Accessible to physics chemists electronic engineers and materials scientists Contents based on recent theoretical developments

*Isotope Shifts in Atomic Spectra* W.H. King, 1984-05-31 Atomic and nuclear physics are two flourishing but distinct branches of physics the subject of isotope shifts in atomic spectra is one of the few that links these two branches It is a subject that has been studied for well over fifty years but interest in the subject far from flagging has been stimulated in recent years Fast computers have enabled theoreticians to evaluate the properties of many electron atoms and laser spectroscopy has made it possible to measure isotope shifts in the previously unmeasurable areas of very rare isotopes short lived radioactive isotopes weak transitions and transitions involving high lying atomic levels Isotope shifts can now be measured with greater accuracy than before in both optical transitions and x ray transitions of muonic atoms this improved accuracy is revealing new facets of the subject I am very grateful to Dr H G Kuhn F R S for having introduced me to the subject in the 1950s and for supervising my efforts to measure isotope shifts in the spectrum of ruthenium I thus approach the subject as an experimental atomic spectroscopist This bias is obviously apparent in my use of the spectroscopist s notation of lower upper for a transition rather than the nuclear physicist s upper lower My reasons are given in Section 1 3 and I hope that nuclear physicists will forgive me for using this notation even for muonic x ray transitions

Ultracold Gases and Quantum Information Christian Miniatura, Leong-Chuan Kwek, Martial Ducloy, Benoît Grémaud, Berthold-Georg Englert, Leticia Cugliandolo, Artur Ekert, Kok Khoo Phua, 2011-05-05 In recent years there has been much synergy between the exciting areas of quantum information science and ultracold atoms This volume as part of the proceedings for the XCI session of Les Houches School of Physics held for the first time outside Europe in Singapore brings together experts in both fields The theme of the school focused on two principal topics quantum information science and ultracold atomic physics The topics range from Bose Einstein Condensates to Degenerate Fermi Gases to fundamental concepts in Quantum Information Sciences including some special topics on Quantum Hall Effects Quantum Phase Transition Interactions in Quantum Fluids Disorder and Interference Phenomena

Trapped Ions and Atoms and Quantum Optical Devices      **Interaction of Hydrogen Isotopes with Transition Metals and Intermetallic Compounds** B.M. Andreev, E.P. Magomedbekov, G.H. Sicking, 1996-03-04 Studying the interactions between heavy hydrogen isotopes and hydride forming metals or intermetallic compounds IMC is of importance for both fundamental and applied sciences These systems offer for example the possibility of technical hydrogen isotope separation due to their considerable isotope effects In addition quite a lot of problems of hydrogen recovery hydrogen purification and tritium storage can be solved This review deals with theoretical aspects of the interaction of heavy hydrogen isotopes with metals and IMC and contains detailed information on phase and isotopic equilibrium and of the kinetics of isotope exchange in systems with hydride phases Numerical data and results from theoretical and experimental studies are presented as well

**Special Issue: Physics of Quantum Information** Vladimir Bužek, 2000

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