

CLUSTER PHYSICS

K.-H. Meiwes-Broer  
(Ed.)

# Metal Clusters at Surfaces

Structure,  
Quantum Properties,  
Physical Chemistry



Springer

# Metal Clusters At Surfaces Structure Quantum Properties Physical Chemistry

**Puru Jena, Qiang Sun**



## **Metal Clusters At Surfaces Structure Quantum Properties Physical Chemistry:**

**Metal Clusters at Surfaces** Karl-Heinz Meiwes-Broer, 2012-12-06 Numerous experiments and calculations have shown that isolated metal clusters possess many interesting features quite different from those known from surface and solid state physics or from atomic and molecular physics The technological exploitation of these new properties e g in miniature electronic or mechanical components requires the cluster to be brought into an environment such as an encapsulating matrix or a surface Due to the interaction with the contact medium the properties of the clusters may change or even disappear Thus the physics of cluster on surface systems the main subject of this book is of fundamental importance The book addresses a wide audience from the newcomer to the expert Starting from fundamental concepts of adsorbate surface interactions the modification of electronic properties through electron confinement and concepts of cluster production it elucidates the distinct properties of the new metallic nanostructures

**Low-Dimensional Systems: Theory, Preparation, and Some Applications** Luis M. Liz-Marzán, Michael Giersig, 2012-12-06 This volume contains papers presented at the NATO Advanced Research Workshop ARW Dynamic Interactions in Quantum Dot Systems held at Hotel Atrium in Puszczykowo near Poznan Poland May 16 19 2002 The term low dimensional systems which is used in the title of this volume refers to those systems which contain at least one dimension that is intermediate between those characteristic of atoms molecules and those of the bulk material Depending on how many dimensions lay within this range we generally speak of quantum wells quantum wires and quantum dots As such an intermediate state some properties of low dimensional systems are very different to those of their molecular and bulk counterparts These properties generally include optical electronic and magnetic properties and all these are partially covered in this book The main goal of the workshop was to discuss the actual state of the art in the broad area of nanotechnology The initial focus was on the innovative synthesis of nanomaterials and their properties such as quantum size effects superparamagnetism or field emission These topics lead us into the various field based interactions including plasmon magnetic spin and exciton coupling The newer more sophisticated methods for characterization of nanomaterials were discussed as well as the methods for possible industrial applications In general chemists and physicists as well as experts on both theory and experiments on nanosized regime structures were brought together to discuss the general phenomena underlying their fields of interest from different points of view

Molecular Building Blocks for Nanotechnology G. Ali Mansoori, Thomas F. George, Lahsen Assoufid, Guoping Zhang, 2007-09-14 This book deals with a bottom up approach to building nanostructured systems where one starts with atoms and molecules which constitute the molecular building blocks MBBs and assembles them to build a nanostructured material Nanotechnology MBBs are distinguished for their unique properties They include for example graphite fullerene carbon nanotubes diamondoids nanowires nanocrystals and amino acids All these MBBs and more are candidates for various applications in nanotechnology These building blocks have quite unique properties not found in small molecules Some of these MBBs are

electrical conductors some are semiconductors some are photonic and the characteristic dimension of each is a few nanometers The examples covered in this book by the sixteen chapters written by authorities all around the world include 1 carbon nanotubes which are five times lighter and five times stronger than steel 2 nanowires which can be made of metals semiconductors or even different types of semiconductors within a single wire and 3 diamondoids a form of pure carbon materials which provide excellent building blocks for positional or robotic assembly as well as for self assembly The applications of MBBs as presented in this book should enable the practitioner of nanotechnology to design and build systems on a nanometer scale The controlled synthesis of MBBs and their subsequent assembly self assembly self replication or positional assembly into nanostructures is a fundamental theme of nanotechnology These promising nanotechnology concepts with far reaching implications from mechanical to chemical processes from electronic components to ultra sensitive sensors from medical applications to energy systems and from pharmaceuticals to agricultural and food chains will impact every aspect of our future

**Superatoms** Puru Jena,Qiang Sun,2021-12-01 Explore the theory and applications of superatomic clusters and cluster assembled materials Superatoms Principles Synthesis and Applications delivers an insightful and exciting exploration of an emerging subfield in cluster science superatomic clusters and cluster assembled materials The book presents discussions of the fundamentals of superatom chemistry and their application in catalysis energy materials science and biomedical sciences Readers will discover the foundational significance of superatoms in science and technology and learn how they can serve as the building blocks of tailored materials promising to usher in a new era in materials science The book covers topics as varied as the thermal and thermoelectric properties of cluster based materials and clusters for CO<sub>2</sub> activation and conversion before concluding with an incisive discussion of trends and directions likely to dominate the subject of superatoms in the coming years Readers will also benefit from the inclusion of A thorough introduction to the rational design of superatoms using electron counting rules Explorations of superhalogens endohedrally doped superatoms and assemblies and magnetic superatoms A practical discussion of atomically precise synthesis of chemically modified superatoms A concise treatment of superatoms as the building blocks of 2D materials as well as superatom based ferroelectrics and cluster based materials for energy harvesting and storage Perfect for academic researchers and industrial scientists working in cluster science energy materials thermoelectrics 2D materials and CO<sub>2</sub> conversion Superatoms Principles Synthesis and Applications will also earn a place in the libraries of interested professionals in chemistry physics materials science and nanoscience

**Progress in Experimental and Theoretical Studies of Clusters** Tamotsu Kondow,Fumitaka Mafun,2003 The cluster which is an ensemble of two thousands of atoms or molecules has emerged as a completely new class of materials at the frontier of materials science The frontier of cluster science extends so rapidly that the map of the science is renewed day by day In order to provide basic knowledge and recent information on this growing field 14 world renowned scientists who are actively involved experimentally and theoretically in

cluster science have written this book which is concise comprehensive suitable for students at both the undergraduate and the graduate level as well as people who work outside cluster science Contents Survey of Structure Energetics and Dynamics of Clusters R S Berry Molecular and Ionic Cluster Spectroscopy J M Lisy Physical and Chemical Properties of Metal Clusters in the Gas Phase and on Solid Surfaces A Terasaki Femtosecond Spectroscopy on Metal Clusters a Vajda et al Core Level Excitation of Clusters E Rhl Laboratory Experiments on Single Levitated Aerosol Particles T Leisner Cluster Formation from Liquid Phase F Mafun r Readership Researchers in atomic physics molecular physics and physical chemistry

**Encyclopedia of Interfacial Chemistry** ,2018-03-29 Encyclopedia of Interfacial Chemistry Surface Science and Electrochemistry Seven Volume Set summarizes current fundamental knowledge of interfacial chemistry bringing readers the latest developments in the field As the chemical and physical properties and processes at solid and liquid interfaces are the scientific basis of so many technologies which enhance our lives and create new opportunities its important to highlight how these technologies enable the design and optimization of functional materials for heterogeneous and electro catalysts in food production pollution control energy conversion and storage medical applications requiring biocompatibility drug delivery and more This book provides an interdisciplinary view that lies at the intersection of these fields Presents fundamental knowledge of interfacial chemistry surface science and electrochemistry and provides cutting edge research from academics and practitioners across various fields and global regions **Russian Journal of Physical Chemistry** ,1999 *JJAP* ,2009 **Physics, Uspekhi** ,2007 *Japanese Journal of Applied Physics* ,2002 **Zeitschrift für physikalische Chemie** ,2001 *American Book Publishing Record* ,2000 **Materials Transactions** ,2009 *Peterson's Guide to Graduate Programs in the Physical Sciences and Mathematics* ,1991 *Journal of Computational and Theoretical Nanoscience* ,2004 **Energy Research Abstracts** ,1995 **Chemical Research Faculties** ,1988 *2000 International Chemical Congress of Pacific Basin Societies* ,2000 **Chekhoslovatskii Fizicheski Zhurnal**. **Czechoslovak Journal of Physics** ,1984 *The Directory of Graduate Studies* ,1999

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