

A. M. Polubotko

The Dipole-Quadrupole  
Theory of Surface  
Enhanced  
Raman Scattering

# Dipole Quadrupole Theory Of Surface Enhanced Raman Scattering

**IM Harris**



## **Dipole Quadrupole Theory Of Surface Enhanced Raman Scattering:**

The Dipole-quadrupole Theory of Surface Enhanced Raman Scattering A. M. Polubotko, 2009 This book is devoted to explanation of SERS in terms of the strong dipole and especially quadrupole light molecule interactions arising in surface fields strongly varying in space in the region of strongly irregular surface roughness The influence of the quadrupole interaction is a matter of principle since it provides explanation for the appearance of forbidden bands arising in a great number of experiments on SERS on symmetrical molecules This essential detail in fact is absent in all other SERS theories that does not permit to create a closed theory which explains the majority of experimental facts accompanying SERS by a unitary approach Moreover as it is demonstrated in the book the huge enhancement in the phenomenon of Single Molecule Detection by the SERS method can be explained exclusively by the strong quadrupole light molecule interaction The first part of the book is devoted to a brief description of main SERS characteristics and critical analysis of theoretical approaches Further the theory of electromagnetic field near some model kinds of rough surfaces and some other systems and the theory of the SER cross section for arbitrary and symmetrical molecules are presented in detail The obtained expressions helps to establish selection rules for contributions in the SER cross section and analyse the SER spectra of symmetrical molecules This analysis corroborates main specific features of the SER spectra of symmetrical molecules and some anomalies which exist in these spectra for some specific conditions The existence of electrodynamic forbiddance of the quadrupole scattering mechanism for the methane molecule and molecules with cubic symmetry groups is established The above theory permits to explain not only the huge enhancement in the phenomenon of Single Molecule Detection but the blinking of the SERS signal too The first layer effect arising in the first layer of absorbed molecules also is considered in detail It appears that the nature of this phenomenon is the electrodynamic enhancement which is very large just in the first layer The other phenomena accompanying SERS are accounted for It is demonstrated that the theory is in a good agreement with the SERS experiments and explains quite a number of characteristics related to the SERS phenomenon

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Biomedical Applications of Microfluidic Devices Michael R. Hamblin, Mahdi Karimi, 2020-11-12 Biomedical Applications of Microfluidic Devices introduces the subject of microfluidics and covers the basic principles of design and synthesis of actual microchannels. The book then explores how the devices are coupled to signal read outs and calibrated including applications of microfluidics in areas such as tissue engineering organ on a chip devices pathogen identification and drug gene delivery. This book covers high impact fields microarrays organ on a chip pathogen detection cancer research drug delivery systems gene delivery and tissue engineering and shows how microfluidics is playing a key role in these areas which are big drivers in biomedical engineering research. This book addresses the fundamental concepts and fabrication methods of microfluidic systems for those who want to start working in the area or who want to learn about the latest advances being made. The subjects covered are also an asset to companies working in this field that need to understand the current state of the art. The book is ideal for courses on microfluidics biosensors drug targeting and BioMEMs and as a reference for PhD students. The book covers the emerging and most promising areas of biomedical applications of microfluidic devices in a single place and offers a vision of the future. Covers basic principles and design of microfluidics devices. Explores biomedical applications to areas such as tissue engineering organ on a chip pathogen identification and drug and gene delivery. Includes chemical applications in organic and inorganic chemistry. Serves as an ideal text for courses on microfluidics biosensors drug targeting and BioMEMs as well as a reference for PhD students. *Raman Spectroscopy* Gustavo Morari Do Nascimento, 2018-04-18 This book gives a wide overview of the state of the art applications of Raman spectroscopy in characterization of materials and biomaterials. The Raman signal is intrinsically smaller than other vibrational techniques however mainly through intensification processes such as resonance Raman RR and surface enhanced Raman spectroscopy SERS the Raman cross section can be strongly amplified. Thoroughly in these signal amplifications the study of a diversity of chemical systems and the use of Raman technique for in situ and in vivo measurements is possible. The main goal of this book is to open up to an extended audience the possibilities of uses of Raman spectroscopy. In fact this collective work will be beneficial to students teachers and researchers of many areas who are interested to expand their knowledge about Raman spectroscopy applied to nanotechnology biotechnology environmental science inorganic chemistry and health sciences. Encyclopedia of Spectroscopy and Spectrometry, 2016-09-22 This third edition of the Encyclopedia of Spectroscopy and Spectrometry Three Volume Set provides authoritative and comprehensive coverage of all aspects of spectroscopy and closely related subjects that use the same fundamental principles including mass spectrometry imaging techniques and applications. It includes the history theoretical background details of instrumentation and technology and current applications of the key areas of spectroscopy. The new edition will include over 80 new articles across the field. These will complement those from the previous edition which have been brought up to date to reflect the latest trends in the field. Coverage in the third edition includes Atomic spectroscopy Electronic spectroscopy Fundamentals in spectroscopy High Energy spectroscopy Magnetic

resonance Mass spectrometry Spatially resolved spectroscopic analysis Vibrational rotational and Raman spectroscopies The new edition is aimed at professional scientists seeking to familiarize themselves with particular topics quickly and easily This major reference work continues to be clear and accessible and focus on the fundamental principles techniques and applications of spectroscopy and spectrometry Incorporates more than 150 color figures 5 000 references and 300 articles for a thorough examination of the field Highlights new research and promotes innovation in applied areas ranging from food science and forensics to biomedicine and health Presents a one stop resource for quick access to answers and an in depth examination of topics in the spectroscopy and spectrometry arenas      Chemical Modelling Alan Hinchliffe, 2007-10-31

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Anzenbacher, Blahoslav Sedláček, 1987      **Selected Papers on Light Scattering** Milton Kerker, 1988      Physics Briefs, 1990      **The Journal of Chemical Physics**, 2003      Journal of the Optical Society of America, 1980      *Advances in Chemical Physics, Volume 85, Part 2* Myron W. Evans, Stanislaw Kielich, 1993-11-11 The Advances in Chemical Physics series provides the chemical physics and physical chemistry fields with a forum for critical authoritative evaluations of advances in every area of the discipline Filled with cutting edge research reported in a cohesive manner not found elsewhere in the literature each volume of the Advances in Chemical Physics series serves as the perfect supplement to any advanced graduate class devoted to the study of chemical physics      Optics and Spectroscopy, 1986      **Dissertation Abstracts International**, 2008      INIS Atomindex, 1985      *Metals Abstracts*, 1985      **Encyclopedia of Spectroscopy and Spectrometry: A-H** John C. Lindon, 2000 The Encyclopedia provides coverage of current knowledge in the field of

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