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Electron Energy-Loss Spectroscopy in the Electron Microscope **Electron Energy and Momentum Spectroscopy in Solids Electron Energy Loss Spectroscopy and Surface Vibrations** *Electron Energy and Position Measurement Using Lead-scintillator Calorimeters with a New Light Collection System* Calculation of Electron Energy Deposition in Thin-film Polymeric Materials Electron Energy Loss Spectrometers *Transmission Electron Energy Loss Spectrometry in Materials Science and the EELS Atlas What's the Matter with Waves?* **Effect of Electrons Produced by Ionization on Calculated Electron-Energy Distributions Low Energy Electrons and Surface Chemistry Effects of Low Energy Protons and High Energy Electrons on Silicon** Low-Energy Electrons An Introduction to the Electron Theory of Metals Particle Induced Electron Emission II **Electron Energy Loss Spectroscopy An Experimental Study for Electron Transmission and Bremsstrahlung Production Electron Energy Loss Spectroscopy Electron Energy and Space Charge Calculations in Reflex Diodes Atomic and Free Electrons in a Strong Light Field** *Electron Energy Degradation in the Atmosphere: Consequent Species and Energy Densities, Electron-Flux, and Radiation Spectra* **Secondary Electron Emission Due to Positive Ion Bombardment** *The Crystallographic Information in Electron Energy Loss Spectra Shielding for High-energy Electron Accelerator Installations* **Low Temperature Electron Irradiation Studies in Metals Whistler Determination of Electron Energy and Density Distributions in the Magnetosphere** *Measuring the Average Electron Energy Losses During the Diffusion of the Electron Beam in Plasma Electron Energy Loss Spectroscopy* **Electron-energy Distributions and Ionization Rates in Hydrogen with Crossed Electric and Strong Magnetic Fields INTERACTION OF A RELATIVISTIC ELECTRON BEAM WITH HELIUM GAS (ELECTRON BEAM). Devices for Electron Energy Measurement** An Electron Energy Loss Spectrometer for Studies of Adsorption on Pd(111). Investigation of Nuclear-energy Levels **Electron and Photon Impact Ionization and Related Topics 2004 Two-dimensional Resonances in Coulomb Few Body System and Theory of Electron Energy and Angular Distribution Secondary Electron Energy Spectroscopy in the Scanning Electron Microscope** *Electron Energy Transfer Rates for Vibrational Excitation of Auger Electron Spectroscopy Reference Manual* **Electron Energy Loss Studies of TiOx̲ Rocket Probe Measurement of Electron Energy Spectra in the Earth's Radiation Backemission of Electrons from Metals Irradiated by 0.2 MeV to 1.4 MeV Electrons**

The calculation of the electron density and electron temperature distribution in our ionosphere (from (almost equal to) 150-600 km) requires a knowledge of the various heating, cooling and energy flow processes that occur. The energy transfer from electrons to neutral gases and ions is one of the dominant electron cooling processes in the ionosphere, and the role of vibrationally excited N2 in this is particularly significant. Electron Energy Loss Spectroscopy (EELS) is a high resolution technique used for the analysis of thin samples of material. The technique is used in many modern transmission electron microscopes to characterise materials. This book provides an up-to-date introduction to the principles and applications of EELS. Specific topics covered include, theory of EELS, elemental quantification, EELS fine structure, EELS imaging and advanced techniques. Auger electron spectroscopy (AES) is based on the Auger total secondary electron energy distribution, and an ion gun to process, which involves the core-level ionization of an atom with provide depth profiling capability. subsequent deexcitation occurring by an outer-level electron de The high surface sensitivity of Auger spectroscopy which dictates caying to fill the core hole. The excess energy is transferred to the need for an ultrahigh-vacuum system is due to the limited and causes the ejection of another electron, which is by definition mean free path of electrons in the 0-3000 e V kinetic energy an Auger electron. The Auger electron transition, denoted by range. The Auger peaks decay exponentially with overlayer cov the electron levels involved, is independent of the excitation erage, which is consistent with an exponential dependence of source and leaves the atom with a constant kinetic energy. The escape probability on the depth of the parent atom. A compila kinetic energy is given by the differences in binding energies for tion of data from a variety of sources has been used to generate the three levels (for example, EK-E L, - EL) minus a correction 2 an escape depth curve which falls in the range of 5-30 A in the term for the work function and electron wave function relaxation. energy range from 0 to 3000 eV. The observed escape depth does When the Auger transition occurs within a few angstroms of the not show a strong dependence on the matrix. of Michigan. The computer simulations were compared to the optical emission data from five HeI and one HeII lines measured in the laboratory. This comparison showed reasonably good agreement. Low-energy and high-energy electron yields have been measured from Al, Cu, Ta, and Pb targets bombarded by 0.2 MeV to 1.4 MeV electrons. An improved apparatus, the hemispherical triode, is shown to be very effective in measuring the total yield of high-energy electrons (= or > 100 eV) and the total yield of low-energy electrons (Electron and Photon Impact Ionization and Related Topics 2004 provides an overview of the latest advances in the field of ionization by electron and photon impact. The book contains 18 contributions of recent experimental, theoretical, and computational work on correlated processes that involve a wide range of targets, including atoms, molecules, c to the Second Edition Since the first (1986) edition of this book, the numbers of installations, researchers, and research publications devoted to electron energy-loss spec troscopy (EELS) in the electron microscope have continued to expand. There has been a trend towards intermediate accelerating voltages and field-emission sources, both favorable to energy-loss spectroscopy, and sev eral types of energy-filtering microscope are now available commercially. Data-acquisition hardware and software, based on personal computers, have become more convenient and user-friendly. Among university re searchers, much thought has been given to the interpretation and utilization of near-edge fine structure. Most importantly, there have been many practi cal applications of EELS. This may reflect an increased awareness of the potentialities of the technique, but in many cases it is the result of skill and persistence on the part of the experimenters, often graduate students. To take account of these developments, the book has been extensively revised (over a period of two years) and more than a third of it rewritten. I have made various minor changes to the figures and added about 80 new ones. Except for a few small changes, the notation is the same as in the first edition, with all equations in SI units. This book/CD package provides a reference on electron energy loss spectrometry (EELS) with the transmission electron microscope, an established technique for chemical and structural analysis of thin specimens in a transmission electron microscope. Describing the issues of instrumentation, data acquisition, and data analysis, the authors apply this technique to several classes of materials, namely ceramics, metals, polymers, minerals, semiconductors, and magnetic materials. The accompanying CD-ROM consists of a compendium of experimental spectra. Electron emission is a fundamental phenomenon which accompanies most interactions of energetic particles with solid surfaces. Not only is it a special effect which for almost ninety years has attracted the interest of physicists, but it is also of acute importance in such fields as radiation effects and transport phenomena in solids (e.g., radiation biology), plasma-surface interactions, microtechnology, surface analysis, ion microscopies, particle detector development and others. While Volume I emphasizes the theoretical description of the mechanisms of electron emission, this volume reviews modern experimental trends and aspects of the phenomenon, e.g., kinetic electron emission from massive solids and from thin foils under bombardment with positive, negative, and neutral particles, and the measurement of electron statistics in connection with potential and kinetic emission due to slow singly and multiply charged projectiles. Previously reported Monte Carlo code calculations of the electron energy distributions and the consequent reflex triode characteristics will be presented for two different anode designs. In addition, a generalized formulation of Poisson's equation will be used to examine the virtual cathode side of a reflex diode. The familiar ''resonance'' solution for the reflex triode is again found, but with a different physical interpretation. In the former case the current diverges, but in the virtual cathode space the linear dimension diverges as one approaches the ''resonance.'' Like rocket science or brain surgery, quantum mechanics is pigeonholed as a daunting and inaccessible topic, which is best left to an elite or peculiar few. This classification was not earned without some degree of merit. Depending on perspective; quantum mechanics is a discipline or philosophy, a convention or conundrum, an answer or question. Authors have run the gamut from hand waving to heavy handed in hopes to dispel the common beliefs about quantum mechanics, but perhaps they continue to promulgate the stigma. The focus of this particular effort is to give the reader an introduction, if not at least an appreciation, of the role that linear algebra techniques play in the practical application of quantum mechanical methods. It interlaces aspects of the classical and quantum picture, including a number of both worked and parallel applications. Students with no prior experience in quantum mechanics, motivated graduate students, or researchers in other areas attempting to gain some introduction to quantum theory will find particular interest in this book. Electron energy loss spectroscopy has become an indispensable tool in surface analysis. Although the basic physics of this technique is well understood, instrument design has previously largely been left to intuition. This book is the first to provide a comprehensive treatment of the electron optics involved in the production of intense monochromatic beams and the detection of scattered electrons. It includes a full three-dimensional analysis of the electron optical properties of electron emission systems, monochromators and lens systems, placing particular emphasis on the procedures for matching the various components. The description is kept mathematically simple and focuses on practical aspects, with many hints for writing computer codes to calculate and optimize electrostatic lens elements. This book presents and describes a series of unusual and striking strong-field phenomena concerning atoms and free electrons. Some of these phenomena are: multiphoton stimulated bremsstrahlung, free-electron lasers, wave-packet physics, above-threshold ionization, and strong-field stabilization in Rydberg atoms. The theoretical foundations and causes of the phenomena are described in detail, with all the approximations and derivations discussed. All the known and relevant experiments are described too, and their results are compared with those of the existing theoretical models. An extensive general theoretical introduction gives a good basis for subsequent parts of the book and is an independent and self-sufficient description of the most efficient theoretical methods of the strong-field and multiphoton physics. This book can serve as a textbook for graduate students. Contents:Introduction to the Theory of Field-Induced Atomic TransitionsMultiphoton Stimulated BremsstrahlungMultiphoton Compton Scattering and Ponderomotive Forces in an Inhomogeneous Light FieldFree-Electron LasersLaser Acceleration of ElectronsWave PacketsAbove-Threshold IonizationStabilization of Atoms in a Strong Ionizing Field Readership: Physicists. keywords:Multiphopton Ionization;Strong-field Stabilization of Atoms;High-Harmonic Generation;Free-Electron Lasers;Above-Threshold Ionization;Electron Wave Packets;Multiphoton Stimulated Bremsstrahlung The experimental data given shows that at an abnormally strong reaction of the beam with plasma, the electrons of the beam lose up to 20% of their initial energy. A method for measuring this loss is described. Electron Energy Loss Spectroscopy (EELS) is a high resolution technique used for the analysis of thin samples of material. The technique is used in many modern transmission electron microscopes to characterise materials. This book provides an up-to-date introduction to the principles and applications of EELS. Specific topics covered include, theory of EELS, elemental quantification, EELS fine structure, EELS imaging and advanced techniques. Polycrystalline platinum and palladium were bombarded with monoenergetic electrons at temperatures below 9K. Changes in electrical resistivity R(E) = delta rho/electron-sq cm were measured in the energy range 1.1 to 3.0 MeV. The experimental values found in this interval are consistent with displacement threshold energies of 37 eV for Pt and 34 eV for Pd. The resistivities per unit defect concentration were found to be 0.00075 and 0.0009 ohm-cm for Pt and Pd respectively. The threshold energies found here, together with values reported for other face centered cubic elements, are shown to be directly proportional to atomic number and inversely proportional to the lattice parameter. It is also shown that the resistivities per unit defect concentration can be correlated with the resistivity at 0C. Analysis of the energy dependence of the damage production indicates atomic displacement cascades are markedly inhibited, which is consistent with deuteron damage studies. Alternative multiple displacement models and possible mechanisms are discussed. (Author). This book deals with the subject of secondary energy spectroscopy in the scanning electron microscope (SEM). The SEM is a widely used research instrument for scientific and engineering research and its low energy scattered electrons, known as secondary electrons, are used mainly for the purpose of nanoscale topographic imaging. This book demonstrates the advantages of carrying out precision electron energy spectroscopy of its secondary electrons, in addition to them being used for imaging. The book will demonstrate how secondary electron energy spectroscopy can transform the SEM into a powerful analytical tool that can map valuable material science information to the nanoscale, superimposing it onto the instrument's normal topographic mode imaging. The book demonstrates how the SEM can then be used to quantify/identify materials, acquire bulk density of states information, capture dopant density distributions in semiconductor specimens, and map surface charge distributions. Fifty-seven nose whistlers recorded at five stations between April 1958 and June 1962 were employed to test the validity of model magnetospheric electron distributions and two theories for the upper cutoff frequency of the whistler signal. Five electron density distributions were tested. In some cases, the ratios of the upper cutoff frequency to the equatorial gyrofrequency, are scattered with most whistlers having the ratio>0.5. This indicateees that the cutoff is probably not caused by escape of high-frequency components fro1m field-aligned ducts. On the other hand, the assumption that the cutoff above the upper cutoff frequency is caused by a thermal Dopplerr shift in the cyclotron resonance is strongly supported. For these whistlers the resonant particle energies at the upper cutoff frequency range between 0.2 and 2.0 keV and in this interva1l the differential energy spectrum of the normalized density is a remarkably smooth fauunction which varies as 1/E with no significant height or time variation. (Author). Low-energy electrons are ubiquitous in nature and play an important role in natural phenomena as well as many potential and current industrial processes. Authored by 16 active researchers, this book describes the fundamental characteristics of low-energy electron–molecule interactions and their role in different fields of science and technology, including plasma processing, nanotechnology, and health care, as well as astro- and atmospheric physics and chemistry. The book is packed with illustrative examples, from both fundamental and application sides, features about 130 figures, and lists over 800 references. It may serve as an advanced graduate-level study course material where selected chapters can be used either individually or in combination as a basis to highlight and study specific aspects of low-energy electron–molecule interactions. It is also directed at researchers in the fields of plasma physics, nanotechnology, and radiation damage to biologically relevant material (such as in cancer therapy), especially those with an interest in high-energy-radiation-induced processes, from both an experimental and a theoretical point of view. A method is presented which describes the discrete energy loss undergone by electrons resulting from absorption events. The initial species, the partitioning of energy, the electron-flux spectra, and radiation band profiles resulting from energy degradation of electrons are calculated for atmospheric compositions corresponding to altitudes between 60 and 145 km and for initial electron energies of 14 to 900 eV. Electron Energy Loss Spectroscopy and Surface Vibrations is devoted to electron energy loss spectroscopy as a probe of the crystal surface. Electrons with energy in the range of a few electron volts sample only a few atomic layers. As they approach or exit from the crystal, they interact with the vibrational modes of the crystal surface, or possibly with other elementary excitations localized there. The energy spectrum of electrons back-reflected from the surface is thus a rich source of information on its dynamics. The book opens with a detailed analysis of the physics that controls the operation of the monochromator, which is the core of the experimental apparatus. Separate chapters follow on the interaction of electrons with vibrational modes of the surface region and with other elementary excitations in the vicinity; the lattice dynamics of clean and adsorbate-covered surfaces, with emphasis on those features of particular relevance to surface vibrational spectroscopy; and selected applications vibration spectroscopy in surface physics and chemistry.