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STANDARD OPERATING PROCEDURE: RENISHAW INVIA RAMAN SPECTROMETER Purpose of this Instrument: The Renishaw inVia Raman Spectrometer is an instrument used to analyze the Raman scattered light from samples to infer the chemistry and structure of the material of interest. Location: 381 Chemistry Research Laboratory

RENISHAW INVIA RAMAN SPECTROMETER
Standard Operating Procedure - Renishaw inVia Micro-Raman Microscope. Susheng Tan, Ph.D. NanoScale Fabrication and Characterization Facility, University of Pittsburgh M104 Benedum Hall, 3700 O ' Hara St., Pittsburgh, PA 15261 Phone: (412) 383-5978, Email: sut6@pitt.edu. Log on the Raman Microscope via FOM in any networked computer.

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Standard Operating Procedure - Renishaw inVia Micro-Raman Microscope Susheng Tan, Ph.D. NanoScale Fabrication and Characterization Facility, University of Pittsburgh M104 Benedum Hall, 3700 O ' Hara St., Pittsburgh, PA 15261 Phone: (412) 383-5978, Email: sut6@pitt.edu Log on the Raman Microscope via FOM in any networked computer.

Standard Operating Procedure Renishaw Invia Micro Raman
Renishaw inVia Reflex Micro-Raman Standard Operating Procedure This user guide describes the proper operation of the Micro-Raman for acquisition of a single point spectral acquisition. System startup 1. Ensure that the Standby/Run switch on the Argon laser is in the Standby position.

Renishaw inVia Reflex Micro-Raman Standard Operating Procedure
Renishaw inVia Reflex Micro-Raman Standard Operating Procedure (2/8/11) This user guide describes the proper operation of the Micro-Raman for acquisition of a single point spectral acquisition. System startup. 1. Make sure the Standby / Run switch on the Modu-Laser RC-1300 Controller is in the Standby position.

Renishaw inVia Reflex Micro-Raman Standard Operating Procedure
The inVia™ spectrometer can be used as standalone unit, and is supplied with an optical table (the dimensions of which are normally 5 ' x 3 ' x 8 " – 1524 mm x 896 mm x 203.2 mm); the "footprint" of the Raman system is

SCA User Manual inVia version - 140605
Standard Operating Procedure: Raman Microscope - Renishaw InVia For general inquiries, contact: Donald J. Goralski Director, Shared Instrumentation Laboratories (716) 645-5151

Raman Microscope - Renishaw InVia - Science & Engineering ...
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Standard Operating Procedure Renishaw Invia Micro Raman
GENERAL INFORMATION | STANDARD OPERATING PROCEDURE. In this system samples are excited by 405, 532, 633 or 785 nm lasers. Laser spot size is ~1 μm and spectral resolution is about 1 cm-1. Signals can be measured within 100 cm-1 of the laser wavelength.

RENISHAW IN VIA MICRO-RAMAN — Columbia Nano Initiative
Standard Operating Procedure Renishaw Invia Micro Raman the facility manager (currently Philip Carubia, pmc228@cornell.edu, B57 Bard Hall, office and cell: 607-255-6757). All procedures are subject to change. Renishaw InVia Operation Summary Renishaw inVia Reflex Micro-Raman Standard Operating Procedure (2/8/11) This user guide describes the Page 7/26

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Download Ebook Standard Operating Procedure Renishaw Invia Micro Raman Renishaw inVia Reflex Micro-Raman Standard Operating Procedure RENISHAW IN VIA MICRO-RAMAN GENERAL INFORMATION | STANDARD OPERATING PROCEDURE In this system samples are excited by 405, 532, 633 or 785 nm lasers. Laser spot size is ~1 μm and spectral resolution is about 1 cm-1.

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The Renishaw wdf file format has been developed to enable handling data files that contain up to 50 million spectra each. 2D maps can be made in either the StreamLine Plus or StreamLineHR mode. With StreamLineHR, Raman images can be acquired as point maps at a data rate of ~50 milliseconds per spectrum.

Cornell Center for Materials Research - Renishaw InVia ...
Renishaw is a recognised leader in Raman spectroscopy, producing high performance Raman systems for a range of applications. Next generation Raman imaging Renishaw has decades of experience developing flexible Raman systems that give reliable results, even for the most challenging measurements.

Raman spectroscopy - Renishaw
Renishaw inVia Reflex Micro-Raman Standard Operating Procedure This user guide describes the proper operation of the Micro-Raman for acquisition of a single point spectral acquisition.

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Standard Operating Procedure Renishaw Invia Micro Raman Reflex Micro-Raman Standard Operating Procedure RENISHAW IN VIA MICRO-RAMAN GENERAL INFORMATION | STANDARD OPERATING PROCEDURE In this system samples are excited by 405, 532, 633 or 785 nm lasers. Laser spot size is ~1 μm and spectral resolution is about 1 cm-1. Page 11/21

These proceedings gather carefully selected, peer-reviewed contributions from the International Conference on Pure and Applied Chemistry (ICPAC 2018). The event, the latest installment in a biennial conference series, was held in July 2018 in Mauritius. The respective chapters in this unique collection reflect a wide range of fundamental and applied research in the chemical sciences and various interdisciplinary subjects. In addition to reviews, they highlight cutting-edge advances.

This book presents contributions from some of the leading experts in spectroscopic techniques including infrared, Raman, NMR, fluorescence and Circular Dichroism spectroscopy. Structural characterization of biomolecules, cells, tissues and whole organisms are amongst the topics that were covered by these experts at the 14th European Conference on Spectroscopy of Biological Molecules (ECSBM2011), held at the University of Coimbra, Portugal, from 29th August to 3rd September 2011, of which this book contains the papers. The book would be particularly valuable for those interested in vibrational spectroscopy and imaging of cells and tissues, applications of spectroscopy in biotechnology, single cell studies and microbial characterization. It highlights the potential of spectroscopy and imaging in medical diagnosis and screening, and discusses issues related to methodology, including data acquisition, analysis and processing, that would be valuable for scientists who are new to the field. The book would be an important reference source for scientists in academia and industry as well as early stage researchers such as graduate students and post-doctoral researchers.

Hydrocarbon Fluid Inclusions in Petroliferous Basins trains readers to detect Hydrocarbon Fluid Inclusions (HCFIs) in sedimentary rocks, particularly the wafer preparation techniques to visualize HCFIs, its distinction from aqueous inclusions, petrographic approaches to HCFIs, microthermometric observations on HCFIs, fluorescence emission spectra and Raman spectra of HCFIs, and their interpretations for the petroleum industry. The book features case studies from the Mumbai and Kerala Konkan Basins of the Western Offshore of India - two representative basins where new, non-destructive, fluid inclusion techniques were tested. This book is essential reading for students of petroleum geology and those working in exploration in the oil and gas industry. Helps readers to identify Hydrocarbon Fluid Inclusions (HCFIs) in sedimentary basins Covers how to determine the oil window, API gravity and chemical constituents in HCFIs Includes case studies on key offshore basins

"This book is structured in seven chapters. Chapter 1 discusses glass science and structures of inorganic glasses, which are commonly used for photonic devices, including oxide, fluoride, chalcogenide and mixed anion glasses. Chapter 2 covers the important thermal, viscosity and physical properties of glasses which, by nucleation and crystal growth processes can be engineered for photonic device applications. In Chapter 3, bulk glass fabrication using melting and casting and sol-gel techniques are discussed along with the fabrication principles of glass-ceramic materials, sol-gel formation and sol-gel based glass fabrication. Chapter 4 introduces the standard geometrical optics for fibre optics, Maxwell's equation for modal analysis and its importance in fibre and waveguide optics. It concludes with a detailed discussion on refractive index and its dependence on compositions, density, temperature and stress. The relationship of these properties in controlling bulk optical properties is especially emphasized. The main emphasis of Chapter 5 is on the methods of thin film fabrication using physical and chemical vapour deposition and on pulsed laser deposition including ion implantation techniques. Chapter 6 starts with the classical radiative transition theory based on dipole models, and then explains the concept of dipoles and electron-phonon coupling. Emphasizing various quantum mechanical rules, it then discusses the radiative, non-radiative, energy transfer and upconversion processes. Finally, chapter 7 covers the photonic device applications of inorganic glasses, fibres and waveguides and concludes with a short discussion on the emerging opportunities in future for inorganic glasses"--

In recent years, kesterite Cu2ZnSnS4 (CZTS) has become an interesting alternative to copper indium gallium (di)selenide (CIGS) due to its non-toxic and earth abundant constituents. A variety of methods is being used to fabricate kesterite thin films, such as coevaporation, sputtering, electrodeposition, spray pyrolysis and others. Most of them include an annealing step to stimulate elemental mixing and interdiffusion. Although conversion efficiencies of kesterite solar cells have increased among different research groups, the record value of 12.6% set by IBM in 2014 has not been broken yet. Therefore, experimental and theoretical studies are needed to predict the effect of the secondary phases and detrimental defects on the electronical properties of the CZTS based solar devices. The work presented here studies non-destructive techniques for in situ process control and monitoring. With the aim to detect phases and phase transitions to optimize crucial processing steps such as pre-annealing of metal precursors, high temperature annealing and vacuum deposition of Cu-Sn-Zn-S based thin films. The research consists of three parts in which Raman spectroscopy, X-ray diffraction (XRD) and reflectometry are used to explore this objective. In the first part Raman spectroscopy is investigated as an in situ monitoring technique during high temperature annealing of thin films. It investigates whether the occurrence of CZTS can be monitored when it is created from annealing a Mo/CTS/ZnS layered thin film. CuS, SnS, ZnS and CTS (Cu-Sn-S) films are prepared by physical vapor deposition. The Raman scattering intensity was compared to investigate whether their specific vibrational modes can be distinguished from each other at room temperature. Then, the CTS film is annealed between 50 and 550 °C in order to investigate whether CTS vibrational modes can be identified at elevated temperatures and to see which transitions take place within the thin film. Also, a CZTS reference film is annealed between 50 and 550 °C for reference purposes. The temperature dependence of the main CZTS modes is examined to investigate whether it can be used for in situ temperature control. Finally, a ZnS layer is deposited on the unannealed CTS film to obtain a Mo/CTS/ZnS layered film. This film is used to study the conversion of CTS/ZnS into CZTS at elevated temperatures. It was found that Raman spectroscopy can successfully be used to monitor formation of CZTS by identifying its main vibrational mode during the annealing process. The intensity of the CTS modes reduces at elevated temperatures. At 450 °C, the main CZTS mode at 338 cm-1 can be clearly identified. The second part also focuses on high temperature annealing. However, in this part the focus lies on annealing of the metal precursor films. It is explored whether specific alloys benefit or hinder the formation of secondary phases during formation of the CZTS absorber films. Also, to what extent this influences solar cell performance. In situ XRD was investigated for in situ monitoring of the pre-annealing process. Cu-poor metal precursor films are prepared by sputtering deposition. The precursors are annealed at 150 °C, 200 °C, 300 °C and 450 °C in a three zone tube furnace. The effect on the structural properties is analysed by XRD to study the formation mechanism of alloys. The precursor films are then sulfurized in a three zone tube furnace. The structural properties of the absorber are analysed and correlated with structures in the precursor. It is found that formation of SnS2 in the absorber is proportional to the remaining Sn in the pre-annealed precursor. Also, electron micrographs showed that pre-annealing temperature influences grain growth and surface precipitation of Sn-S and Zn-S. Pre-annealed absorbers at 450 °C did not exhibit these phases on the surface. Solar devices are fabricated from the absorber films and best performing devices were obtained from pre-annealed absorbers at 450 °C. They showed absence of Sn and SnS2 in, respectively, the precursor and absorber. It could be concluded that SnS2 phases are detrimental to device efficiency and that SnS2 XRD peak intensity follows an inverse proportionality with device efficiency. The third part explores reflectometry as a method to monitor a growing film during thermal evaporation in a physical vapor deposition (PVD) system. A set of six CZTS absorbers is examined by ex situ Raman spectroscopy and reflectometry to study the influence of secondary phases CuS and ZnS on reflection spectra. Composition strongly influences reflection spectra and CuS leaves a characteristic dip in the reflection spectrum at about 600 nm. An integration method was used to analyze this phenomenon quantitatively. Subsequently, a reflectometry setup is designed, developed and integrated in the PVD system. Four different CZTS co-evaporated and multi-layered films are deposited. Structural, morphological and vibrational properties are investigated. The reflection spectra are monitored during deposition and time-dependent reflection spectra are analyzed for characteristic aspects related to properties such as thickness, band gap and phase formation. CuS could not be detected in the films by the integration method due to the superposition of the CuS dip with developing interference fringes during film growth. However, in multilayered CTS/ZnS film it is found that the onset of ZnS deposition can be detected by increased reflection intensity due to reduced surface roughness. Additionally, the shifting onset of the interference fringes to lower photon energies can be used as a characteristic fingerprint during the deposition process. In conclusion, this work showed that Raman spectroscopy, XRD and reflectometry could be successfully implemented for in situ process control and monitoring of high temperature annealing and vacuum deposition of Cu-Sn-Zn-S based precursors and absorbers. The application of these in situ techniques can lead to the optimization of thin film material properties and solar cells. As such, this study has paved the way for further improvement of Cu-Sn-Zn-S based precursors and thin film absorbers. Innerhalb der letzten Jahre hat sich Kesterit Cu2ZnSnS4 (CZTS) aufgrund seiner ungiftigen Bestandteile und deren hoher Verfügbarkeit zu einer interessanten Alternative zu Kupfer Indium Gallium (di-)Selenid (CIGS) entwickelt. Zur Herstellung von Kesterit Dünnschichten wird eine Vielzahl von Methoden verwendet wie Ko-Verdampfung, Sputtern, Elektrodeposition, Spray Pyrolyse und andere. Die meisten davon beinhalten einen Temper-Schritt um die Durchmischung und Interdiffusion der Elemente zu stimulieren. Obwohl der Wirkungsgrad der Kersterit Solarzellen von verschiedenen Forschungsgruppen erhöht wurde, ist der Rekordwert von IBM von 12,6 % noch nicht gebrochen worden. Daher werden experimentelle und theoretische Studien benötigt, die den Einfluss von Fremdphasen und schädlichen Defekten auf die elektronischen Eigenschaften der CZTS Solarzellen vorhersagen. Die vorliegende Arbeit untersucht zerstörungsfreie Methoden für die in situ Prozesskontrolle und -überwachung. Dabei ist das Ziel, entscheidende Prozessschritte wie das Vortempern der Metall-Vorläufer sowie das Hochtemperatur-Tempern und die Vakuum-Abscheidung von Cu-Sn-Zn-S basierten Schichten zu optimieren. Die Untersuchung besteht aus drei Teilen, in denen Raman-Spektroskopie, Röntgendiffraktion (XRD) und Reflektometrie benutzt werden um dieses Ziel zu erreichen. Im ersten Teil wird die Ramanspektroskopie als in situ Methode zur Überwachung des Hochtemperatur-Temperns von Dünnschichten betrachtet. Es wird untersucht, ob das Entstehen von CZTS beim Tempern von gestapelten Mo/CTS/ZnS Dünnschichten beobachtet werden kann. CuS, SnS, ZnS und CTS (Cu-Sn-S) Schichten werden durch physikalische Gasabscheidung hergestellt. Die Intensität der Raman Streuung wurde vergleichen um zu untersuchen, ob die spezifischen Vibrations-Moden bei Raumtemperatur voneinander unterschieden werden können. Dann werden die CTS Schichten zwischen 50 °C und 550 °C getempert um zu untersuchen, ob die CTS Vibrations-Moden bei höheren Temperaturen identifiziert werden können und um festzustellen, welche Übergänge innerhalb der Schicht auftreten. Außerdem wurde eine CZTS Referenzschicht zwischen 50 °C und 550 °C für Referenzzwecke getempert worden. Die Temperaturabhängigkeit der CZTS Haupt-Moden werden betrachtet, um zu untersuche, ob sie für die in situ Temperaturüberwachung verwendet werden können. Abschließend wurde eine ZnS Schicht auf einem nicht getemperten CTS Film abgeschieden, um eine gestapelte Mo/CTS/ZnS Schicht zu erhalten. Diese Schicht wird verwendet, um die Umwandlung von CTS/ZnS zu CZTS bei erhöhten Temperaturen zu untersuchen. Es wurde festgestellt, dass Raman Spektroskopie erfolgreich verwendet werden kann, um die Bildung von CZTS zu überwachen, indem die Haupt-Vibrations-Moden während des Temperns identifiziert werden. Die Intensität der CTS Moden verringert sich bei höheren Temperaturen. Bei 450 °C kann die CZTS Hauptmode bei 338 cm-1 klar identifiziert werden. Der zweite Teil konzentriert sich ebenfalls auf das Hochtemperatur-Tempern. In diesem Teil liegt der Fokus allerdings auf dem Tempern der Metal-Vorläufer-Schichten. Es wird erforscht, ob bestimmte Legierungen die Entstehung von Fremdphasen während der Entstehung der CZTS Absorberschichten begünstigen oder hemmen und welchen Einfluss dies auf die Leistung der Solarzelle hat. In situ XRD wird verwendet, um die Prozesse des Vortemperns zu überwachen. Kupfer arme Metall-Vorläufer-Schichten werden durch Sputtern aufgetragen. Die Vorläufer werden bei 150 °C, 200 °C, 300 °C und 450 °C in einem Drei-Zonen-Röhren-Ofen getempert. Die Auswirkungen auf die strukturellen Eigenschaften werden mit XRD analysiert, um den Entstehungsmechanismus der Legierungen zu untersuchen. Die Vorläuferschichten werden dann in einem Drei-Zonen-Röhren-Ofen sulfurisiert. Die strukturellen Eigenschaften des Absorbers werden analysiert und mit der Struktur der Vorläufer korreliert. Es wurde festgestellt, dass die Entstehung von SnS2 im Absorber proportional zum verbleibenden Sn im vorgetemperten Vorläufer ist. Außerdem zeigen Bilder des Rasterelektronenmikroskops, dass die Temperatur des Vortemperns das Kornwachstum und das Abscheiden von Sn-S und Zn-S an der Oberfläche beeinflusst. Bei 450 °C vorgetemperte Absorber weisen keine dieser Phasen an der Oberfläche auf. Solarzellen werden aus diesen Absorber-Schichten hergestellt und die besten Zellen entstanden aus den bei 450 °C vorgetemperten Absorbern. Bei diesen traten Sn und SnS2 weder im Vorläufer noch im Absorber auf. Es konnte geschlussfolgert werden, dass SnS2 Phasen schädlich für den Wirkungsgrad der Zellen sind und dass die Intensität der SnS2 XRD Peaks invers proportional zum Wirkungsgrad der Zellen ist. Der dritte Teil erforscht die Reflektometrie als Methode zur Überwachung des Schichtwachstums während des thermischen Verdampfens in einer Anlage zur physikalischen Gasabscheidung (PVD). Ein Satz aus sechs CZTS Absorbern wird mittels ex situ Raman-Spektroskopie und Reflektometrie vermessen, um den Einfluss der Fremdphasen CuS und ZnS auf die Reflexionsspektren zu untersuchen. Die Zusammensetzung beeinflusst die Reflexionsspektren stark und CuS hinterlässt eine charakteristische Senkung bei 600 nm im Reflexionsspektrum. Eine Integrationsmethode wurde verwendet um dieses Phänomen quantitativ zu analysieren. Anschließend wurde ein Reflektometrieaufbau entworfen, entwickelt und in die PVD-Anlage integriert. Vier verschiedene CZTS koverdampfte und Mehrschicht-Filme wurden abgeschieden. Strukturelle, morphologische und Vibrationseigenschaften werden untersucht. Die Reflexionsspektren werden während des Abscheidens aufgenommen und zeitabhängige Reflexionsspektren werden auf charakteristische Aspekte im Zusammenhang mit Eigenschaften wie Dicke, Bandlücke und Entstehung von Phasen untersucht. CuS konnte in den Schichten mit der Integrations-Methode wegen der Überlagerung der CuS Senkung mit dem entstehenden Interferenzmuster nicht detektiert werden. Allerdings wurde in gestapelten CTS/ZnS Schichten beobachtet werden, dass der Beginn der ZnS Abscheidung durch eine ansteigende Intensität der Reflektion aufgrund der verringerten Oberflächenrauigkeit detektiert werden kann. Zusätzlich kann die Verschiebung des Startpunkts der Interferenzen zu niedrigeren Photonenenergien als charakteristischer Fingerabdruck während des Abscheidungsprozesses verwendet werden. Zusammenfassend zeigt diese Arbeit, dass Raman-Spektroskopie, XRD und Reflektometrie erfolgreich als in situ Prozesskontrolle und – überwachung bei Hochtemperatur-Tempern und Vakuum-Abscheidung von Cu-Sn-Zn-S basierten Vorläufern und Absorbern realisiert werden konnten. Die Anwendung dieser in situ Techniken kann zu einer Optimierung der Eigenschaften von Dünnschicht-Materialien und von Solarzellen führen. Als solche hat diese Untersuchung den Weg für weitere Verbesserung von Cu-Sn-Zn-S basierte Vorläufer und Dünnschicht-Absorber geebnet.

Nanostructured Zinc Oxide covers the various routes for the synthesis of different types of nanostructured zinc oxide including; 1D (nanorods, nanowires etc.), 2D and 3D (nanosheets, nanoparticles, nanospheres etc.). This comprehensive overview provides readers with a clear understanding of the various parameters controlling morphologies. The book also reviews key properties of ZnO including optical, electronic, thermal, piezoelectric and surface properties and techniques in order to tailor key properties. There is a large emphasis in the book on ZnO nanostructures and their role in optoelectronics. ZnO is very interesting and widely investigated material for a number of applications. This book presents up-to-date information about the ZnO nanostructures-based applications such as gas sensing, pH sensing, photocatalysis, antibacterial activity, drug delivery, and electrodes for optoelectronics. Reviews methods to synthesize, tailor, and characterize 1D, 2D, and 3D zinc oxide nanostructured materials Discusses key properties of zinc oxide nanostructured materials including optical, electronic, thermal, piezoelectric, and surface properties Addresses most relevant zinc oxide applications in optoelectronics such as light-emitting diodes, solar cells, and sensors

The papers included in this issue of ECS Transactions were originally presented in the symposium ¿ Battery and Energy Technology Joint General Session ¿ , held during the PRiME 2008 joint international meeting of The Electrochemical Society and The Electrochemical Society of Japan, with the technical cosponsorship of the Japan Society of Applied Physics, the Korean Electrochemical Society, the Electrochemistry Division of the Royal Australian Chemical Institute, and the Chinese Society of Electrochemistry. This meeting was held in Honolulu, Hawaii, from October 12 to 17, 2008.

Explores Chemical-Based, Non-Chemical Based, and Advanced Fabrication Methods The Graphene Science Handbook is a six-volume set that describes graphene ' s special structural, electrical, and chemical properties. The book considers how these properties can be used in different applications (including the development of batteries, fuel cells, photovoltaic cells, and supercapacitors based on graphene) and produced on a massive and global scale. Volume One: Fabrication Methods Volume Two: Nanostructure and Atomic Arrangement Volume Three: Electrical and Optical Properties Volume Four: Mechanical and Chemical Properties Volume Five: Size-Dependent Properties Volume Six: Applications and Industrialization This handbook describes the fabrication methods of graphene; the nanostructure and atomic arrangement of graphene; graphene ' s electrical and optical properties; the mechanical and chemical properties of graphene; the size effects in graphene, characterization, and applications based on size-affected properties; and the application and industrialization of graphene. Volume one is dedicated to fabrication methods and strategies of graphene and covers: Various aspects of graphene device process flows Experimental procedures for graphene nanoribbons (GNRs) from graphene Advances in graphene synthesis routes The fabrication of graphene nanoribbons (GNRs) by different methods The synthesis of graphene oxide, its reduction, and its functionalization with organic materials The electrophoretic deposition (EPD) processing of graphene family materials The preparation of graphene using the solvent dispersion method Methods for the preparation of graphene oxide The fabrication and performance of a gate-free graphene pH sensor Advances in wet chemical fabrication of graphene, graphene oxide (GO) and more

Encyclopedia of Interfacial Chemistry: Surface Science and Electrochemistry 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