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Surface Analysis and Defect Analysis *Defect Analysis in the TEM.* **Defect Analysis in Electron Microscopy Defect Analysis and Data Collection Software for an Iron Foundry Defect Analysis and Realistic Fault Model Extensions for Multi-port SRAMs** Manufacturing Defect Analysis and Waste Minimization Defect analysis with atomic-resolution microscopy **Defect Analysis with Atomic-resolution Microscopy** Defect and Microstructure Analysis by Diffraction Structural Analysis of Point Defects in Solids **Radiation Damage in Silicon Hybrid Non-destructive Technique for Volumetric Defect Analysis and Reconstruction by Remote Laser Induced Ultrasound** *Passive Components Failure Analysis and SMT Defect Analysis Two-dimensional Structural Defect Analysis Techniques* **Continuous Surface Testing by Laser Scanning with Automatic Defect Analysis and Sorting Equipment Defect Analysis Using Resonant Ultrasound Spectroscopy Flux Pinning, Defect Analysis and Growth of High Temperature Superconducting Single Crystals Simulation Results of an Efficient Defect Analysis Procedure** *Improved Requirements Engineering Based on Defect Analysis* **Uncertainty Quantification of Stochastic Defects in Materials** *Casting Defect Analysis Expert System* **Impurity and Defect Analysis in Solids by Channeling An Optical Data Base for Defect Analysis of Florida Citrus Tests of Randomness in Semiconductor Defect Analysis** Engineering Defect Analysis *Root Cause Analysis Analysis and Classification of Film Defect Repair Quality* Defect Analysis of Aluminum Nitride **Defect Analysis in High-resistivity Semiconductors by Transient Deep-level Spectroscopy (TDLS)** *Crystal Form and Defect Analysis of Pharmaceutical Materials* Automated Defect Analysis in Electron Microscopy Images **Use of Tracer Method for Casting Defect Analysis Defect-Oriented Testing for Nano-Metric CMOS VLSI Circuits** Defect Analysis of Germania Doped Silica Glasses **Defect Recognition and Image Processing in Semiconductors 1997** Development of Lean Six Sigma and Sustainability Model for Product Defect Analysis and Solution: A Case Study in Food Processing Industry **Defect Analysis in III-V Semiconductor Thin Films Grown by Hydride Vapor Phase Epitaxy** Bulk Defect Analysis with a High-energy Positron Beam Defect Analysis of HDB Buildings **Extended Defects in Germanium**

This study focuses on the performance of coffee packaging machine in producing as minimum as possible the black line defect. Quantitative data such as cycle time, defect count, downtimes, number of operators, production rates and others are collected directly from production floor and production history. Quantitative information for feedbacks from operator and packaging supervisor are also recorded. Information gathered over six months period provides good randomized samples. Then solution alternatives are designed to solve the problem before selecting the best solution. The total time taken from start to finish of entire project are set at 9 months. There are two filter paper packaging machine focused in this case study to validate success of solutions. Defect Recognition and Image Processing in Semiconductors 1997 provides a valuable overview of current techniques used to assess, monitor, and characterize defects from the atomic scale to inhomogeneities in complete silicon wafers. This volume addresses advances in defect analyzing techniques and instrumentation and their application to substrates, epilayers, and devices. The book discusses the merits and limits of characterization techniques; standardization; correlations between defects and device performance, including degradation and failure analysis; and the adaptation and application of standard characterization techniques to new materials. It also examines the impressive advances made possible by the increase in the number of nanoscale scanning techniques now available. The book investigates defects in layers and devices, and examines the problems that have arisen in characterizing gallium nitride and silicon carbide. Uncertainty Quantification of Stochastic Defects in Materials investigates the uncertainty quantification methods for stochastic defects in material microstructures. It provides effective supplementary approaches for conventional experimental observation with the consideration of stochastic factors and uncertainty propagation. Pursuing a comprehensive numerical analytical system, this book establishes a fundamental framework for this topic, while emphasizing the importance of stochastic and uncertainty quantification analysis and the significant influence of microstructure defects on the material macro properties. Key Features Consists of two parts: one exploring methods and theories and the other detailing related examples Defines stochastic defects in materials and presents the uncertainty quantification for defect location, size, geometrical configuration, and instability Introduces general Monte Carlo methods, polynomial chaos expansion, stochastic finite element methods, and machine learning methods Provides a variety of examples to support the introduced methods and theories Applicable to MATLAB® and ANSYS software This book is intended for advanced students interested in material defect quantification methods and material reliability assessment, researchers investigating artificial material microstructure optimization, and engineers working on defect influence analysis and nondestructive defect testing. This PhD thesis is devoted to the design, development and implementation of a non-contact hybrid non-destructive testing (NDT) method applied to the analysis of metallic objects that contain embedded defects or fractures. We propose a hybrid opto-acoustic technique that combines laser generated ultrasound as exciter and ultrasound transducers as receivers. This work envisages a detailed study of the detection and one, two or three-dimensional reconstruction of defects, using the proposed hybrid technique and its application as a remotely controlled non-contact NDT. Our device combines several advantages of both photonic and ultrasonic techniques, while reduces some of the drawbacks of both individual methods. Our method relay on the combination of experimental results with high-resolution signal processing procedures based on different mathematical algorithms. Our basic experimental setup uses a nanosecond pulsed laser at 532nm wavelength that impacts onto the surface of the object under study. The laser pulse is rapidly absorbed into a shallow volume of material and creates a localized thermo-elastic expansion inducing a broadband ultrasound pulse that propagate inside the material. The laser beam scans a selected area of the object surface, being remotely controlled by means of a programmable XY scanner. For each excitation point, the ultrasound waves propagate through the object are reflected or scattered by material 3D defects. They are detected by ultrasound transducers and recorded with a PC data-acquisition system for a further process and analysis. As a first step, the time of flight analysis provides enough data for the location and size of the defect in 1D view. The detection capabilities of internal defects in a metallic sample are studied by means of wavelet transform, chosen due to its multi-resolution time-frequency characteristics. A novel algorithm using a density-based spatial clustering is applied to the resulting time frequency maps to estimate the defect's position. For the 2D visualization and reconstruction of the defects we extended the signal analysis using the synthetic aperture focusing technique (SAFT). We implement a novel 2D apodization window filtering applied along with the SAFT, and we show it removes undesired effects of the side lobes and wide-angle reflections of ultrasound waves, enhancing the reconstructed image of the defect. We move then towards the 3D analysis and reconstruction of defects and in this case we achieve and implement a fully non-contact and automatized experimental configuration allowing the scan areas on different object's faces. The defect details are recorded from different angles/perspectives and a complete 3D reconstruction is achieved. Finally, we show our results on a complementary topic related to a particular case of the ultrasound propagation in solids. We were concerned on the physical understanding of the propagation and diffraction of ultrasound waves in solid materials from the first moment. The control of the diffraction pattern in solids, using an ultrasonic lens, would help focus/collimate the ultrasound reducing echoes and boundary reflections, resulting in a further improve NDT process. Phononic crystals have been used to regulate the diffraction and frequency response of ultrasonic waves traveling in fluids. However, they were much less studied in solid materials due to the difficulty of building the crystal and to high coupling losses. We perform detailed numerical simulations of the ultrasound propagation in a solid phononic crystal and we show focusing and the self-collimation effects. We further extend our analysis and couple our phononic crystal lens to a solid under study, showing that the diffraction control is preserved inside the target solid object trough the coupling material. Although there are many books on root cause analysis (RCA), most concentrate on team actions such as brainstorming and using quality tools to discuss the failure under investigation. These may be necessary steps during RCA, but authors often fail to mention the most important member of an RCA team—the failed part. Root Cause Analysis: A Step-By-Step Guide to Using the Right Tool at the Right Time provides authoritative guidance on how to empirically investigate quality failures using scientific method in the form of cycles of plan-do-check-act (PDCA), supported by the use of quality tools. Focusing on the use of proven quality tools to empirically investigate issues, the book starts by describing the theoretical background behind using the scientific method and quality tools for RCA. Next, it supplies step-by-step instructions for performing RCA with the tools discussed in the first section. The book’s clear examples illustrate how to integrate PDCA with the scientific method and quality tools when investigating real-world quality failures. This RCA guide provides root cause investigators with a tool kit for the quick and accurate selection of the appropriate tool during a root cause investigation. It includes an appendix with a guide to tool selection based on the intended use of the tool. There is also an appendix that defines the terminology used in the book. After reading this book, you will understanding how to integrate the scientific method, quality tools, and statistics, in the form of exploratory data analysis, to build a picture of the actual situation under investigation that will lead you to the true root cause of an event. The tools and concepts presented in the text are appropriate for professionals in both the manufacturing and service industries. Strutural Analysis of Point Defects in Solids introduces the principles and techniques of modern electron paramagnetic resonance (EPR) spectroscopy essentialfor applications to the determination of microscopic defect structures. Investigations of the microscopic and electronic structure, and also correlations with the magnetic propertiesof solids, require various multiple magnetic resonance methods, such as ENDOR and optically detected EPR or ENDOR. This book discusses experimental, technological and theoretical aspects of these techniques comprehensively, from a practical viewpoint, with many illustrative examples taken from semiconductors and other solids. The nonspecialist is informed about the potential of the different methods, while the researcher faced with the task of determining defect structures isprovided with the necessary tools, together with much information on computer-aided methods of data analysis and the principles of modern spectrometer design. The aim is to give an overview of the physics of extended defects in Germanium, i.e. dislocations (line defects), grain boundaries, stacking faults, twins and {311} defects (two-dimensional defects) and precipitates, bubbles, etc. The first part covers fundamentals, describing the crystallographic structure and other physical and electrical properties, mainly of dislocations. Since dislocations are essential for the plastic deformation of Germanium, methods for analysis and imaging of dislocations and to evaluate their structure are described. Attention is given to the electrical and optical properties, which are important for devices made in dislocated Ge. The second part treats the creation of extended defects during wafer and device processing. Issues are addressed such as defect formation during ion implantation, necessary to create junctions, which are an essential part in every device type. Extended defects are also created during the deposition of thin or thick epitaxial layers on other substrates, which are important for optoelectronic and photovoltaic applications. In brief, the book is intended to provide a fundamental understanding of the extended-defect formation during Ge materials and device processing, providing ways to distinguish harmful from less detrimental defects and should point out ways for defect engineering and control. Torrance Casting is an iron foundry located in La Crosse, Wisconsin. The foundry produces castings by melting raw materials into molten iron, which are then poured into molds created from compressed sand. While creating castings from molten iron is a considerably low tech endeavor, there are many opportunities to improve the efficiency of their business through computer software. The process of creating castings produces a large array of data that must be recorded for accounting, defect analysis and process control. Currently this data is recorded manually on paper forms and filed away for future reference. This manuscript describes the design and development of a software application for an iron foundry in process control, data collection, and defect identification. The application allows the foundry workers to replace current paper processes with a flexible interactive process to record data produced in the casting process. It also replaces manual data collection with intuitive graphical data entry screens. This data can later be easily analyzed to determine the cause of casting defects. The 2nd edition of defect oriented testing has been extensively updated. New chapters on Functional, Parametric Defect Models and Inductive fault Analysis and Yield Engineering have been added to provide a link between defect sources and yield. The chapter on RAM testing has been updated with focus on parametric and SRAM stability testing. Similarly, newer material has been incorporated in digital fault modeling and analog testing chapters. The strength of Defect Oriented Testing for nano-Metric CMOS VLSIs lies in its industrial relevance. Hydride vapor phase epitaxy (HVPE) is an epitaxial growth technique renowned for its ability to grow III-V semiconductors at high growth rates using lower cost reagents compared to metal-organic vapor phase epitaxy (MOVPE), the current industry standard. Recent interest in III-V photovoltaics has led to increased attention on HVPE. While the technique came to maturity in the 70s, much is unknown about how defects incorporate in HVPE-grown materials. Further understanding of how defects incorporate in III-V materials grown by HVPE is necessary to facilitate wider adoption of the technique. This information would inform strategies for minimizing and eliminating defects in HVPE materials, allowing for the formation of high performance devices. This investigation presents a study of multiple defects in III-V semiconductors grown by HVPE in the context of specific device applications, spanning point defects comprised of individual atoms to extended defects which propagate throughout the crystal. The incorporation of the arsenic anti-site defect, AsGa, intrinsic point defect was studied in high growth rate GaAs layers with potential photovoltaic applications. Relationships between growth conditions and incorporation of AsGa in GaAs epilayers were determined. The incorporation of AsGa depended strongly on the growth conditions employed, and a model was developed to predict the concentration of anti-site defects as a function of those growth conditions. Dislocations and anti-phase domain boundaries (APDBs), two types of extended defects, were investigated in the heteroepitaxial GaAs/Ge system. It was found that the use of 6° miscut substrates and specific growth temperatures led to elimination of APDBs. Dislocation densities were reduced through the use of high growth temperatures. The third and final application investigated was the growth of InxGa1-xAs metamorphic buffer layers (MBLs) by HVPE. The relationships between the growth conditions and the alloy composition were determined, and a model was developed to explain the observed behavior. Compositional grading strategies were explored and insight into the minimization of dislocations in these layers was developed. The dislocation microstructure was analyzed by TEM and related to the layer design, leading to the development of an atomic scale model for dislocation nucleation and propagation throughout the MBL layers. Defect and Microstructure Analysis by Diffraction is focused on extracting information on the real structure of materials from their diffraction patterns. The primary features of a powder diffraction pattern are determined by the "idealized" periodic nature of the crystal structure. With theadvent of computer automation the techniques for carrying out qualitative, quantitative and structure analysis based on the primary pattern features rapidly matured. In general, the deviations of a particular specimen, from the ideal or perfect crystal structure, cause diffraction peak profiles tobroaden and sometimes to become asymmetric. Thus, information on the real structure or microstructure of a specimen can be obtained from a careful study of the diffraction line profiles. The evolving techniques for microstructure analysis from diffraction patterns such as micro-strain, crystallitesize, macro-strain and preferred orientation analysis require an ever more detailed understanding of the effects of crystallographic mistakes on peak assymmetry and the effect of the distribution of small crystallites on the tails of diffraction peaks. This book provides a comprehensive analysis ofthe fundamental theory and techniques for microstructure analysis from diffraction patterns and summarizes the current state of the art. This complete survey lays the foundation for the next and last major development in this field: the extraction of the full information in a powder pattern by thesimulation of the full experimental pattern. The goal of this branch of science is to extract all of the information locked in the powder diffraction pattern including: the types and densities of stacking faults, the strain field produced by each, the anisotropic crystallite size and orientation,along with the size and strain distributions of each phase in a specimen. This book provides a complete summary of the developments of the twentieth century and points the way. A program using a positron beam to probe defects in bulk materials has been developed at Lawrence Livermore National Laboratory. Positron annihilation lifetime spectroscopy (PALS) provides non-destructive analysis of average defect size and concentration. A 3 MeV positron beam is supplied by Sodium-22 at the terminal of a Pelletron accelerator. The high-energy beam allows large (greater than or equal to 1 cm2) engineering samples to be measured in air or even sealed in an independent environment. A description of the beam-PALS system will be presented along with a summary of recent measuremen. This thesis demonstrates the practicability of using Resonant Ultrasound Spectroscopy (RUS) in combination with Finite Element Analysis (FEA) to determine the size and location of a defect in a material of known geometry and physical constants. Defects were analyzed by comparing the actual change in frequency spectrum measured by RUS to the change in frequency spectrum calculated using FEA. FEA provides a means of determining acceptance/rejection criteria for Non-Destructive Testing (NDT). If FEA models of the object are analyzed with defects in probable locations; the resulting resonant frequency spectra will match the frequency spectra of actual objects with similar defects. By analyzing many FEA-generated frequency spectra, it is possible to identify patterns in behavior of the resonant frequencies of particular modes based on the nature of the defect (location, size, depth, etc.). Therefore, based on the analysis of sufficient FEA models, it should be possible to determine nature of defects in a particular object from the measured resonant frequency. Experiments were conducted on various materials and geometries comparing resonant frequency spectra measured using RUS to frequency spectra calculated using FEA. Measured frequency spectra matched calculated frequency spectra for steel specimens both before and after introduction of a thin cut. Location and depth of the cut were successfully identified based on comparison of measured to calculated resonant frequencies. However, analysis of steel specimens with thin cracks, and of ceramic specimens with thin cracks, showed significant divergence between measured and calculated frequency spectra. Therefore, it was not possible to predict crack depth or location for these specimens. This thesis demonstrates that RUS in combination with FEA can be used as an NDT method for detection and analysis of cracks in various materials, and for various geometries, but with some limitations. Experimental results verify that cracks can be detected, and their depth and location determined with reasonable accuracy. However, experimental results also indicate that there are limits to the applicability of such a method, the primary one being a lower limit to the size of crack - especially thickness of the crack - for which this method can be applied. Summary ; Samenvatting.

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