



# Infrared Detectors

**Manijeh Razeghi**



## **Infrared Detectors:**

Infrared Detectors and Systems E. L. Dereniak, G. D. Boreman, 1996 *Infrared Detectors and Systems* offers a deep and detailed examination of the optical detection process and the electronics of mimicking the eye. It further explores recent research in new detector materials and the latest advances in optical detectors. This text covers the range of subjects necessary for the understanding of modern infrared imaging systems at a level appropriate for seniors or first year graduate students in physics or electrical engineering. The first six chapters focus on fundamental background issues of radiation detection beginning with the basics of geometrical optics and finishing with a discussion of the figures of merit used for describing the signal to noise performance of a detector system. Other topics include radiometry and flux transfer issues, basic radiation detector mechanisms and random process mathematics. The book concludes with a close look at infrared detection systems and related issues. In the discussion of infrared search systems the range equation is developed in terms of the optical and detector parameters of the system. A separate chapter is devoted to modulation transfer function, a spatial frequency domain description of image quality. The final chapter describes the design equations for thermal imager systems in terms of noise equivalent temperature difference and minimum resolvable temperature. Supported and clarified by 470 illustrations and accompanied by an extensive glossary of the nomenclature, this is an excellent text for graduate and senior level courses in radiometry and infrared detectors. It is also a valuable reference for practicing engineers involved in the use, design, analysis and testing of infrared detector based systems.

*Optical and Infrared Detectors* R.J. Keyes, 2013-06-05 This volume is written for those who desire a comprehensive analysis of the latest developments in infrared detector technology and a basic insight into the fundamental processes which are important to evolving detection techniques. Each of the most salient infrared detector types is treated in detail by authors who are recognized as leading authorities in the specific areas addressed. In order to concentrate on pertinent aspects of the present state of the detector art and the unique point of view of each author, extensive tutorials of a background nature are avoided in the text but are readily available to the reader through the many references given. The volume opens with a broad brush introduction to the various types of infrared detectors that have evolved since Sir William Herschel's discovery of infrared radiation 175 years ago. The second chapter presents an overall perspective of the infrared detector art and serves as the cohesive cement for the more in depth presentation of subsequent chapters. Those detector types which for one reason or other have not attained wide use today are also discussed in Chapter 2. The more notable and widely used infrared detectors can be divided into three basic classes which are indicative of the primary effect produced by the photon detector interaction: i.e. thermal, photoconductive, photo-voltaic and photoemissive. Chapters 3, 4 and 5 offer a detailed treatment of each of these important processes.

**Infrared Detectors** Antonio Rogalski, 2010-11-15 Completely revised and reorganized while retaining the approachable style of the first edition, *Infrared Detectors Second Edition* addresses the latest developments in the science and technology of infrared IR detection.

Antoni Rogalski an internationally recognized pioneer in the field covers the comprehensive range of subjects necessary to un

**Infrared Detectors** Antonio Rogalski, 2000-04-17 Infrared Detectors provides comprehensive coverage of this important aspect of infrared technology including details of recent research efforts directed toward improving the performance of single element devices large electronically scanned arrays and higher operating temperatures Discussions include HgCdTe detectors Schottky barrier photoemissive devices silicon germanium and InSb detectors and quantum well infrared photodetectors The author also considers IR thermal detectors including details on pyroelectric detectors micromachined silicon bolometers and high Tc superconductor detectors Infrared Detectors and Emitters: Materials and Devices Peter

Capper, C.T. Elliott, 2001 An up to date view of the various detector emitter materials systems currently in use or being actively researched The book is aimed at newcomers and those already working in the IR industry It provides both an introductory text and a valuable overview of the entire field **Fundamentals of Infrared Detector Materials** Michael A.

Kinch, 2007 The choice of available infrared IR detectors for insertion into modern IR systems is both large and confusing The purpose of this volume is to provide a technical database from which rational IR detector selection criteria evolve and thus clarify the options open to the modern IR system designer Emphasis concentrates mainly on high performance IR systems operating in a tactical environment although there also is discussion of both strategic environments and low to medium performance system requirements **Fundamentals of Infrared and Visible Detector Operation and Testing** John

David Vincent, Steve Hodges, John Vampola, Mark Stegall, Greg Pierce, 2015-10-26 Presents a comprehensive introduction to the selection operation and testing of infrared devices including a description of modern detector assemblies and their operation This book discusses how to use and test infrared and visible detectors The book provides a convenient reference for those entering the field of IR detector design test or use those who work in the peripheral areas and those who teach and train others in the field Chapter 1 contains introductory material Radiometry is covered in Chapter 2 The author examines Thermal detectors in Chapter 3 the Classical photon detectors simple photoconductors and photovoltaics in Chapter 4 and Modern Photon Detectors in Chapter 5 Chapters 6 through 8 consider respectively individual elements and small arrays of elements the readouts ROICs used with large imaging arrays and Electronics for FPA Operation and Testing The Test Set and The Testing Process are analyzed in Chapters 9 and 10 with emphasis on uncertainty and trouble shooting Chapters 11 through 15 discuss related skills such as Uncertainty Cryogenics Vacuum Optics and the use of Fourier Transforms in the detector business Some highlights of this new edition are that it Discusses radiometric nomenclature and calculations detector mechanisms the associated electronics how these devices are tested and real life effects and problems Examines new tools in Infrared detector operations specifically selection and use of ROICs electronics for FPA operation operation of single element and very small FPAs microbolometers and multi color FPAs Contains five chapters with frequently sought after information on related subjects such as uncertainty optics cryogenics vacuum and the use of Fourier mathematics for

detector analyses Fundamentals of Infrared and Visible Detector Operation and Testing Second Edition provides the background and vocabulary necessary to help readers understand the selection operation and testing of modern infrared devices

**Proceedings of the Sixth International Symposium on Long Wavelength Infrared Detectors and Arrays: Physics and Applications** Sheng S. Li, 1999

**Long Wavelength Infrared Detectors** Manijeh Razeghi, 2020-03-09 This timely work presents a comprehensive overview of the development of new generations of infrared detectors based on artificially synthesized quantum structures The growth of quantum wells and superlattices is well documented in this volume as are the principal new superlattice technologies for long wavelength infrared detection Featuring insightful contributions from researchers working at the cutting edge of this exciting field this volume is sure to become an essential reference for advanced graduate students and researchers alike

**Handbook of Infrared Detection Technologies** M. Henini, M. Razeghi, 2002-12-11 Introduction Comparison of Photon and Thermal Detectors Performance GaAs AlGaAs Based Quantum Well Infrared Photodetector Focal Plane Arrays GaInAs P Based Qwips on GaAs InP and Si Substrates for Focal Plane Arrays InAs GaIn Sb Superlattices A Promising Material System for Infrared Detection GaSb InAs Superlattices for Infrared FPAs MCT Properties Growth Methods and Characterization HgCdTe 2D Arrays Technology and Performance Limits Status of HgCdTe MBE Technology Silicon Infrared Focal Plane Arrays PolySiGe Uncooled Microbolometers for Thermal Infrared Detection Infrared Silicon Germanium Detectors Fundamentals of Spin Filtering in Ferromagnetic Metals with Application to Spin Sensors

**New Ternary Alloy Systems for Infrared Detectors** Antoni Rogalski, 1994

*Micro and Nanophotonics for Semiconductor Infrared Detectors* Zoran Jakšić, 2014-09-25 The advent of microelectromechanical system MEMS technologies and nanotechnologies has resulted in a multitude of structures and devices with ultra compact dimensions and with vastly enhanced or even completely novel properties In the field of photonics it resulted in the appearance of new paradigms including photonic crystals that exhibit photonic bandgap and represent an optical analog of semiconductors and metamaterials that have subwavelength features and may have almost arbitrary values of effective refractive index including those below zero In addition to that a whole new field of plasmonics appeared dedicated to the manipulation with evanescent surface bound electromagnetic waves and offering an opportunity to merge nanoelectronics with all optical circuitry In the field of infrared technologies MEMS and nanotechnologies ensured the appearance of a new generation of silicon based thermal detectors with properties vastly surpassing the conventional thermal devices However another family of infrared detectors photonic devices based on narrow bandgap semiconductors has traditionally been superior to thermal detectors Literature about their micro and nanophotonic enhancement has been scarce and scattered through journals This book offers the first systematic approach to numerous different MEMS and nanotechnology based methods available for the improvement of photonic infrared detectors and points out to a path towards uncooled operation with the performance of cryogenically cooled devices It is shown that a vast area for enhancement does exist and that photonic devices can readily

keep their leading position in infrared detection The various methods and approaches described in the book are also directly applicable to different other types of photodetectors like solar cells often with little or no modification *Infrared Detectors and Emitters: Materials and Devices* Peter Capper,C.T. Elliott,2013-11-27 Infrared IR detectors fall into two main categories thermal and photon The earliest detectors of IR were thermal in nature e g thermometers The subsequent developments of these detectors such as thermopiles resistance bolometers Golay cells and pyroelectric detectors can operate at ambient temperature but have disadvantages of insensitivity and slowness A wide variety of semiconductor photon detectors have been developed and these possess very high sensitivity high frequency response but have the disadvantage of needing cryogenic cooling particularly at longer wavelengths In the main the applications have been in the military sphere but widespread industrial and scientific applications also exist The majority of development funding for these semiconducting IR detectors has however come from military sources This book is an attempt to provide an up to date view of the various IR detector emitter materials systems currently in use or being actively researched The book is aimed at newcomers to the field and at those already working in the IR industry It is hoped that the former will find the book readable both as an introductory text and as a useful guide to the literature Workers in one of the various IR areas will hopefully find the book useful in bringing them up to date with other sometimes competing technologies To both groups of readers we trust that the book will prove interesting thought provoking and a spur to further progress in this fascinating and challenging field of endeavour

**Proceedings of the Fifth International Symposium on Long Wavelength Infrared Detectors and Arrays: Physics and Applications** Sheng S. Li,H. C. Liu,M. Z. Tidrow,1997 **Infrared and Terahertz Detectors, Third Edition** Antoni Rogalski,2019-01-10 This new edition of Infrared and Terahertz Detectors provides a comprehensive overview of infrared and terahertz detector technology from fundamental science to materials and fabrication techniques It contains a complete overhaul of the contents including several new chapters and a new section on terahertz detectors and systems It includes a new tutorial introduction to technical aspects that are fundamental for basic understanding The other dedicated sections focus on thermal detectors photon detectors and focal plane arrays *Recent Developments in the Field of IR Detectors* ,2025-08-01 Recent Developments in the Field of IR Detectors Volume 118 in the Semiconductors and Semimetals series highlights new advances in the field with this new volume presenting interesting chapters including Type II superlattice unipolar barrier infrared detectors Fabrication and characterization of Ga free T2SL structure for high performance infrared photodetector Extracting Material and Structural Properties from Conventional Test Data of III V Superlattice Detectors Antimony based Type II superlattice infrared detectors Focal Plane Arrays Near room temperature InAsSb based infrared photodetectors and more Other sections cover Interband cascade infrared Photodetectorsand Engineering of Superlattice Based Avalanche Photodiodes Provides the latest information on Recent Developments in the Field of IR Detectors research Offers outstanding and original reviews on a range of Recent Developments in the Field of IR Detectors research topics

Serves as an indispensable reference for researchers and students alike      **ASTIA Subject Headings** Defense Documentation Center (U.S.),1959      **Infrared Detectors** Richard D. Hudson,Jacqueline Wordsworth Hudson,1975

**Handbook of Infrared Detection Technologies** M. Henini,M Razeghi,2002-12-11 The use of lasers which emit infra red radiation and sophisticated detectors of IR radiation is increasing dramatically they are being used for long distance fibre optic communications and remote environmental monitoring and sensing Thus they are of interest to the telecommunications industry and the military in particular This book has been designed to bring together what is known on these devices using an international group of contributors      **Thesaurus of Engineering and Scientific Terms** Engineers Joint Council,1967

## **Infrared Detectors** Book Review: Unveiling the Power of Words

In a world driven by information and connectivity, the energy of words has become more evident than ever. They have the capability to inspire, provoke, and ignite change. Such could be the essence of the book **Infrared Detectors**, a literary masterpiece that delves deep into the significance of words and their impact on our lives. Published by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we will explore the book's key themes, examine its writing style, and analyze its overall effect on readers.

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