

Optical Microscanners and Microspectrometers using Thermal Bimorph Actuators



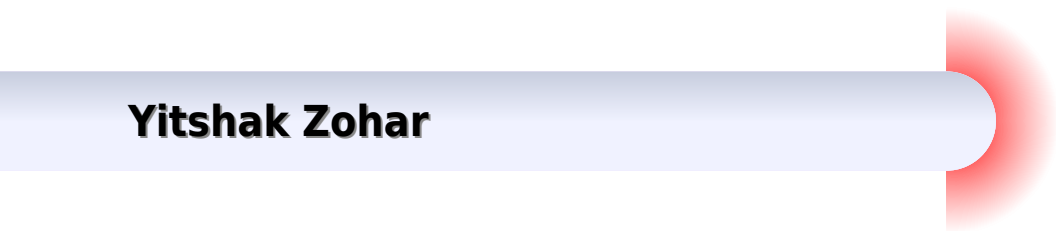
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Optical Microscanners And Microspectrometers Using Thermal Bimorph Actuators

Yitshak Zohar



Optical Microscanners And Microspectrometers Using Thermal Bimorph Actuators:

Optical Microscanners and Microspectrometers using Thermal Bimorph Actuators Gerhard Lammel, Sandra Schweizer, Philippe Renaud, 2013-03-09 Optical Microscanners and Microspectrometers using Thermal Bimorph Actuators shows how to design and fabricate optical microsystems using innovative technologies and original architectures A barcode scanner laser projection mirror and a microspectrometer are explained in detail starting from the system conception discussing simulations choice of cleanroom technologies design fabrication device test packaging all the way to the system assembly An advanced microscanning device capable of one and two dimensional scanning can be integrated in a compact barcode scanning system composed of a laser diode and adapted optics The original design of the microscanner combines efficiently the miniaturized thermal mechanical actuator and the reflecting mirror providing a one dimensional scanning or an unique combination of two movements depending on the geometry The simplicity of the device makes it a competitive component The authors rethink the design of a miniaturized optical device and find a compact solution for a microspectrometer based on a tunable filter and a single pixel detector A porous silicon technology combines efficiently the optical filter function with a thermal mechanical actuator on chip The methodology for design and process calibration are discussed in detail The device is the core component of an infrared gas spectrometer **Optical MEMS** Huikai Xie, Frederic Zamkotsian Aix, 2019-08-06 This book is a printed edition of the Special Issue Optical MEMS that was published in Micromachines **Mems/Nems** Cornelius T. Leondes, 2007-10-08 This significant and uniquely comprehensive five volume reference is a valuable source for research workers practitioners computer scientists students and technologists It covers all of the major topics within the subject and offers a comprehensive treatment of MEMS design fabrication techniques and manufacturing methods It also includes current medical applications of MEMS technology and provides applications of MEMS to opto electronic devices It is clearly written self contained and accessible with helpful standard features including an introduction summary extensive figures and design examples with comprehensive reference lists **Mechanical Engineers' Handbook, Volume 2** Myer Kutz, 2015-02-06 Full coverage of electronics MEMS and instrumentation and control in mechanical engineering This second volume of Mechanical Engineers Handbook covers electronics MEMS and instrumentation and control giving you accessible and in depth access to the topics you ll encounter in the discipline computer aided design product design for manufacturing and assembly design optimization total quality management in mechanical system design reliability in the mechanical design process for sustainability life cycle design design for remanufacturing processes signal processing data acquisition and display systems and much more The book provides a quick guide to specialized areas you may encounter in your work giving you access to the basics of each and pointing you toward trusted resources for further reading if needed The accessible information inside offers discussions examples and analyses of the topics covered rather than the straight data formulas and calculations you ll find in other handbooks Presents the most

comprehensive coverage of the entire discipline of Mechanical Engineering anywhere in four interrelated books Offers the option of being purchased as a four book set or as single books Comes in a subscription format through the Wiley Online Library and in electronic and custom formats Engineers at all levels will find Mechanical Engineers Handbook Volume 2 an excellent resource they can turn to for the basics of electronics MEMS and instrumentation and control **Optimal**

Synthesis Methods for MEMS S.G.K. Ananthasuresh, 2012-12-06 The field of microelectromechanical systems or MEMS has gradually evolved from a discipline populated by a small group of researchers to an enabling technology supporting a variety of products in such diverse areas as mechanical and inertial sensors optical projection displays telecommunications equipment and biology and medicine Critical to the success of these products is the ability to design them and this invariably involves detailed modeling of proposed designs Over the past twenty years such modeling has become increasingly sophisticated with full suites of MEMS oriented computer aided design tools now available worldwide But there is another equally important side to the design process In my own book *Microsystem figuring out what to build in the first place* Design I chose to emphasize the modeling aspect of design The task of figuring out what to build was defined by a vague step called creative thinking I used practical product examples to illustrate the many subtle characteristics of successful designs but I made no attempt to systematize the generation of design proposals or optimized designs That systemization is called synthesis which is the subject of this book **Dynamics of Microelectromechanical Systems** Nicolae Lobontiu, 2014-07-08

Dynamics of Microelectromechanical Systems is a systematic overview of the dynamics of MEMS microelectromechanical systems microstructures and their responses The focus is on the mechanical structural micro domain and the compliant nature of mechanical transmission Features of this work include An in depth treatment of problems that involve reliable modeling analysis and design Analytical models with correct dependences on service dimensions Cantilever based systems for nanofabrication researchers and designers and Dynamics of complex spring and beam microsystems This material contains numerous fully solved examples as well as many end of the chapter problems This is a follow up to the book *Mechanics of Microelectromechanical Systems* by Lobontiu and Garcia Springer 2004 but the material in this new book is self contained An instructor's solution manual is available on the book's webpage at springer.com *Dynamics of Microelectromechanical Systems* is a timely text and reference for microstructural engineers microengineers and MEMS specialists **BioMEMS** Gerald Urban, 2007-02-01

Explosive growth in the field of microsystem technology MST has introduced a variety of promising products in major disciplines from microelectronics to life sciences Especially the life sciences and health care business was and is expected to be a major market for MST products Undoubtedly the merging of biological sciences with micro and nanoscience will create a scientific and technological revolution in future Microminiaturization of devices down to the nanoscale approaching the size of biological structures will be a prerequisite for the future success of life sciences Bioanalytical and therapeutic micro and nanosystems will be mandatory for system

biologists in the long run to obtain insight into morphology the function and the interactive processes of the living system With such a deeper understanding new and personalized drugs could be developed leading to a revolution in life sciences Today microanalytical devices are used in clinical analytics or molecular biology as gene chips In parallel standard microbiomedical products are employed in the intensive care and surgical theatre mainly for monitoring and implantation purposes The gap between these two different scientific fields will be closed however as soon as functional micro devices can be produced allowing a deeper view into the function of cells and whole organisms Here a new discipline evolved which focuses on microsystems for living systems called BIOMEMS In this review at a glance the exciting field of bio microsystems from their beginnings to indicators of future successes are presented It will also show that a broad penetration of micro and nano technologies into biology and medicine will be mandatory for future scientific and new product development progress in life science

Principles and Applications of NanoMEMS Physics Hector Santos,2006-07-02 Principles and Applications of NanoMEMS Physics presents the first unified exposition of the physical principles at the heart of NanoMEMS based devices and applications In particular after beginning with a comprehensive presentation of the fundamentals and limitations of nanotechnology and MEMS fabrication techniques the book addresses the physics germane to this dimensional regime namely quantum wave particle phenomena including the manifestation of charge discreteness quantized electrostatic actuation and the Casimir effect and quantum wave phenomena including quantized electrical conductance quantum interference Luttinger liquids quantum entanglement superconductivity and cavity quantum electrodynamics Potential building blocks are also addressed for NanoMEMS applications including nanoelectromechanical quantum circuits and systems such as charge detectors the which path electron interferometer and the Casimir oscillator as well as a number of quantum computing implementation paradigms Finally NanoMEMS applications in photonics are addressed including nanophotonic light sources and plasmonic devices

Micromachined Mirrors Robert Conant,2013-04-17 Micromachined Mirrors provides an overview of the performance enhancements that will be realized by miniaturizing scanning mirrors like those used for laser printers and barcode scanners and the newly enabled applications including raster scanning projection video displays and compact high speed fiber optic components There are a wide variety of methods used to fabricate micromachined mirrors each with its advantages and disadvantages There are however performance criteria common to mirrors made from any of these fabrication processes For example optical resolution is related to the mirror aperture the mirror flatness and the scan angle Micromachined Mirrors provides a framework for the design of micromirrors and derives equations showing the fundamental limits for micromirror performance These limits provide the micromirror designer tools with which to determine the acceptable mirror geometries and to quickly and easily determine the range of possible mirror optical resolution and scan speed

Heat Convection in Micro Ducts Yitshak Zohar,2013-03-09 As the field of Microsystems expands into more disciplines and new applications such as RF MEMS Optical MEMS and Bio MEMS thermal management is

becoming a critical issue in the operation of many microdevices including microelectronic chips Heat Convection in Micro Ducts focuses on the fundamental physics of convective heat transfer in microscale and specific applications such as microchannel heat sinks micro heat pipes microcoolers and micro capillary pumped loops This book will be of interest to the professional engineer and graduate student interested in learning about heat removal and temperature control in advanced integrated circuits and microelectromechanical systems

Optical Micro-electro-mechanical Systems for Add/drop Multiplexing and Infrared Gas Spectroscopy John William Provine, 2005 **Book Review Index**, 2003 Every 3rd issue is a quarterly cumulation

Laserscanner und Minispektrometer basierend auf hochdispersiven optischen Dünnschichtfiltern Sabine Peters, 2014-08-22 Zwei neuartige integrierte Bauelemente werden erstmals realisiert und ihre Möglichkeiten und Limitationen diskutiert ein Dünnschicht Laserscanner und ein Dünnschicht Minispektrometer Die Bauelemente sind mit ca 10 mm³ von sehr geringer Baugröße Es wird zudem gezeigt dass mit dem vorgestellten Konzept eine Strahlablenkung im Raum ohne den Einsatz mechanischer Aktuatoren möglich ist

Mechanical Engineers' Handbook: Instrumentation, systems, controls, and MEMS Myer Kutz, 2006 A single source for mechanical engineers offering all the critical information they require

The British National Bibliography Arthur James Wells, 2002

A MEMS-based Optical Scanner Using Aerosol Jet Printed PZT Thin-film Bimorph Actuators Ming-Yao Li, 2020

Optimization of a MEMS-based Optical Scanner Using Aerosol Jet Printed PZT Thin-film Bimorph Actuators [?], 2021

Low-voltage, Large-range MEMS Optical Scanners and Their Applications Lei Wu, 2009 Several novel actuators based on electrothermal bimorph actuation are developed in this work that solve problems in previous generations including large mirror center shift large initial tilting and elevation complicated mirror control and low fill factor The lateral shift free LSF large vertical displacement LVD actuator realizes versatile optical scanners including tip tilt piston TTP mirrors lens scanners and large aperture mirrors with large axial scan The TTP mirror demonstrates 2 D tip tilt scan 60 and piston scan 0.6 mm at

DEVELOPMENT OF NOVEL 2 DOF THERMAL MICRO ACTUATORS AND A COMPARISON OF DIFFERENT DISPLACEMENT MEASUREMENT TECHNIQUES. Rene D'Entremont, 2011

Polymer-Ceramic MEMS Bimorphs as Thermal Infrared Sensors Clinton Gregory Warren, 2010 Thermal infrared detectors based on MEMS bimorph beams have the potential to exceed the performance of current uncooled thermal infrared cameras both in terms of sensitivity and cost These cameras are part of a rapidly growing industry are used for a vast array of applications such as military and civilian night vision industrial monitoring and medical imaging Many researchers have explored the use of metal ceramic MEMS bimorphs for this application even though it has long been acknowledged that polymer ceramic bimorphs would be superior However because of the difficulties of designing and fabricating MEMS systems based on polymer ceramic bimorphs little progress has been made towards their development This dissertation describes the initial design fabrication and testing of thermo mechanical infrared sensors based on MEMS polymer ceramic bimorph beams Sensors based on bimorphs composed of both the biopolymer chitin on poly silicon and OCG

825 photoresist on poly silicon were fabricated and tested Chitin bimorphs were fabricated using a novel photolithographic chitosan process previously developed for this research A sensor design based on a residual stress and ambient temperature compensating geometry and which includes novel features such as vertically aligned thermal isolation regions and selective shielding is presented Simplified sensors were tested using an optical readout method where the deformation of the sensors was observed as variations in the intensity of visible light reflected to a digital camera In order to obtain quantitative measurements image analysis was performed While the feasibility of simply observing the average brightness of the light reflected from a sensor was demonstrated several image processing algorithms were tested and shown to increase the signal to noise ratio An IR source approximating a blackbody was combined with a series of filters and lenses to limit transmission of light to the sensor to wavelengths from approximately 1.0 to 3.6 microns A periodic signal was produced by coupling a mechanical chopper wheel with the IR source The sensor was able to detect these signals at frequencies of at least 5 Hz By comparing the sensor signal to a known rate of warming of the IR source and the measured noise level at equilibrium a noise equivalent temperature difference of as low as 360 mK was measured In light of this encouraging and clear proof of concept suggestions for achieving performance gains and developing novel imaging systems based on polymer ceramic bimorphs through future research efforts are offered

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