

Oled Displays Fundamentals And Applications

This handbook offers a comprehensive description of the science, technology, economic and human interface factors associated with the displays industry. With expert contributions from over 150 international display professionals and academic researchers, it covers all classes of display device and discusses established principles, emergent technologies, and particular areas of application.

Introduction to Flat Panel Displays describes the fundamental physics and materials of major flat panel display technologies including LED, OLED, LCD, PDP and FED and reflective displays. A reference for graduate students and new entrants to the display industry, the book currently covers the basic science behind each display technology and gives solved problems and homework problems in each chapter to aid self-study. With advancements in this field, there is enough change in the FPD industry to justify a second edition. This book offers the latest information on modern display technology and features new developments in OLED materials including phosphorescent, TTA, and TADF OLEDs, white light OLED and light extraction. It provides key information on blue phase, automotive lighting, quantum-dot enhanced LCDs, device configurations and performance, and LEDs, specifically nitrate-based. Application features include OLED for mobile, TV, light and flexible OLED, and reflective display specifically e-paper technology and low power consumption displays.

This textbook provides a basic understanding of the principles of the field of organic electronics, through to their applications in organic devices. Useful for both students and practitioners, it is a teaching text as well as an invaluable resource that serves as a jumping-off point for those interested in learning, working and innovating in this rapidly growing field. Organics serve as a platform for very low cost and high performance optoelectronic and electronic devices that cover large areas, are lightweight, and can be both flexible and conformable to fit onto irregularly shaped surfaces such as foldable smart phones. Organic electronics is at the core of the global organic light emitting device (OLED) display industry. OLEDs also have potential uses as lighting sources. Other emerging organic electronic applications include organic solar cells, and organic thin film transistors useful in medical and a range of other sensing, memory and logic applications. This book is a product of both one and two semester courses that have been taught over a period of more than two decades. It is divided into two sections. Part I, Foundations, lays down the fundamental principles of the field of organic electronics. It is assumed that the reader has an elementary knowledge of quantum mechanics, and electricity and magnetism. A background knowledge of organic chemistry is not required. Part II, Applications, focuses on organic electronic devices. It begins with a discussion of organic thin film deposition and patterning, followed by chapters on organic light emitters, detectors, and thin film transistors. The last chapter describes several devices and phenomena that are not covered in the previous chapters, since they lie somewhat outside of the current mainstream of the field, but are nevertheless important.

A single-volume resource featuring state-of-the art reviews of key elements of the roll-to-roll manufacturing processing methodology Roll-to-roll (R2R) manufacturing is an important manufacturing technology platform used extensively for mass-producing a host of film-type products in several traditional industries such as printing, silver-halide photography, and paper. Over the last two decades, some of the methodologies and know-how of R2R manufacturing have been extended and adapted in many new technology areas, including microelectronics, display, photovoltaics, and microfluidics. This comprehensive book presents the state-of-the-art unit operations of the R2R manufacturing technology, providing a practical resource for scientists, engineers, and practitioners not familiar with the fundamentals of R2R technology. Roll-to-Roll Manufacturing: Process Elements and Recent Advances reviews new developments in areas such as flexible glass, display, and photovoltaics and covers a number of process innovations implemented recently to extend and improve the capabilities of traditional R2R lines. It covers such topics as: coating and solidification processes, in-line vacuum deposition, drying, web handling and winding, polymer film substrates, novel hybrid composite films, flexible solar cells and more. Additionally, this book: Examines key elements (unit operations) of the R2R technology, and discusses how these elements are utilized and integrated to achieve desired process efficiencies in a host of applications. Illustrates several established and novel application areas where R2R processing is utilized in current or future products. Discusses process design methodology and key advantages of R2R manufacturing technology over batch or sheet-to-sheet operations. Roll-to-Roll Manufacturing: Process Elements and Recent Advances is an ideal book for undergraduate and graduate students in various science and engineering disciplines, as well as for scientists, engineers, and technical and business leaders associated in any way with the development, commercialization, and manufacture of a variety of film products.

Principles and Applications of Organic Light Emitting Diodes (OLEDs) explores the ways in which the development of organic semiconductor materials is opening up new applications in electronic and optoelectronic luminescent devices. The book begins by covering the principles of luminescence and the luminescent properties of organic semiconductors. It then covers the development of luminescent materials for OLEDs, discussing the advantages and disadvantages of organic versus inorganic luminescent materials. The fabrication and characterization of OLEDs is also covered in detail, including information on, and comparisons of, vacuum deposition and solution techniques. Finally, applications of OLEDs are explored, including OLEDs in solid-state lighting, colored lighting, displays and potential future applications, such as ultra-thin and flexible technologies. This book is an excellent resource both for experts and newcomers to the field of organic optoelectronics and OLEDs. It is ideal for scientists working on optical devices, lighting, display and imaging technologies, and for all those engaged in research in photonics, luminescence and optical materials. Provides a one-stop guide to OLED technology for the benefit of newcomers to the field of organic optoelectronics. Comprehensively covers the luminescent properties of organic semiconductors and their development into OLED materials. Offers practical

information on OLED fabrication and their applications in solid-state lighting and displays, making this essential reading for optoelectronics engineers and materials scientists

This book covers all of the aspects necessary to the design and manufacturing of OLED displays. Topics include emission mechanism, material selection, device processing, manufacturing issues and countermeasures and display design basics. In addition, the book defines elements of OLED such as Thin Film Transistor (TFT) backplane design and processing details, including Low Temperature Poly Silicon (LTPS) process and circuit integration, and high yield method to manufacturer. Researchers and developers are aiming at making large OLED televisions and companies such as Samsung and Apple are rumored to be using OLED display for new screens. In addition to discussing the current composition of OLED, the book also covers the future for OLED technologies and displays. The Society for Information Display (SID) is an international society, which has the aim of encouraging the development of all aspects of the field of information display. Complementary to the aims of the society, the Wiley-SID series is intended to explain the latest developments in information display technology at a professional level. The broad scope of the series addresses all facets of information displays from technical aspects through systems and prototypes to standards and ergonomics. In the extensive fields of optics, holography and virtual reality, technology continues to evolve. *Displays: Fundamentals and Applications, Second Edition* addresses these updates and discusses how real-time computer graphics and vision enable the application and displays of graphical 2D and 3D content. This book explores in detail these technological developments, as well as the shifting techniques behind projection displays, projector-camera systems, stereoscopic and autostereoscopic displays. This new edition contains many updates and additions reflecting the changes in fast developing areas such as holography and near-eye displays for Augmented and Virtual reality applications. Perfect for the student looking to sharpen their developing skill or the master refining their technique, Rolf Hainich and Oliver Bimber help the reader understand the basics of optics, light modulation, visual perception, display technologies, and computer-generated holography. With almost 500 illustrations *Displays* will help the reader see the field of augmentation and virtual reality display with new eyes. Features:

- Covers physics, technology and techniques behind flat-panel as well as projection displays, projector-camera systems, stereoscopic and autostereoscopic displays, computer-generated holography, and near-eye displays
- Discusses how real-time computer graphics and computer vision enable the visualization of graphical 2D and 3D content
- Augmented by close to 500 rich illustrations, which give readers a clear understanding of existing and emerging display technology

This high-class book reflects a decade of intense research, culminating in excellent successes over the last few years. The contributions from both academia as well as the industry leaders combine the fundamentals and latest research results with application know-how and examples of functioning displays. As a result, all the four important aspects of OLEDs are covered: - syntheses of the organic materials - physical theory of electroluminescence and device efficiency - device conception and construction - characterization of both materials and devices. The whole is naturally rounded off with a look at what the future holds in store. The editor, Klaus Muellen, is director of the highly prestigious MPI for polymer research in Mainz, Germany, while the authors include Nobel Laureate Alan Heeger, one of the most notable founders of the field, Richard Friend, as well as Ching Tang, Eastman Kodak's number-one OLED researcher, known throughout the entire community for his key publications.

LEDs are in the midst of revolutionizing the lighting industry Up-to-date and comprehensive coverage of light-emitting materials and devices used in solid state lighting and displays Presents the fundamental principles underlying luminescence Includes inorganic and organic materials and devices LEDs offer high efficiency, long life and mercury free lighting solutions

An extensive introduction to the engineering and manufacture of current and next-generation flat panel displays This book provides a broad overview of the manufacturing of flat panel displays, with a particular emphasis on the display systems at the forefront of the current mobile device revolution. It is structured to cover a broad spectrum of topics within the unifying theme of display systems manufacturing. An important theme of this book is treating displays as systems, which expands the scope beyond the technologies and manufacturing of traditional display panels (LCD and OLED) to also include key components for mobile device applications, such as flexible OLED, thin LCD backlights, as well as the manufacturing of display module assemblies. *Flat Panel Display Manufacturing* fills an important gap in the current book literature describing the state of the art in display manufacturing for today's displays, and looks to create a reference the development of next generation displays. The editorial team brings a broad and deep perspective on flat panel display manufacturing, with a global view spanning decades of experience at leading institutions in Japan, Korea, Taiwan, and the USA, and including direct pioneering contributions to the development of displays. The book includes a total of 24 chapters contributed by experts at leading manufacturing institutions from the global FPD industry in Korea, Japan, Taiwan, Germany, Israel, and USA. Provides an overview of the evolution of display technologies and manufacturing Treats display products as systems with manifold applications, expanding the scope beyond traditional display panel manufacturing to key components for mobile devices and TV applications Provides a detailed overview of LCD manufacturing, including panel architectures, process flows, and module manufacturing Provides a detailed overview of OLED manufacturing for both mobile and TV applications, including a chapter dedicated to the young field of flexible OLED manufacturing Provides a detailed overview of the key unit processes and corresponding manufacturing equipment, including manufacturing test & repair of TFT array panels as well as display module inspection & repair Introduces key topics in display manufacturing science and engineering, including productivity & quality, factory architectures, and green manufacturing *Flat Panel Display Manufacturing* will appeal to professionals and engineers in R&D departments for display-related technology development, as well as to graduates and Ph.D. students specializing in LCD/OLED/other flat panel displays.

Liquid Crystal Devices are crucial and ubiquitous components of an ever-increasing number of technologies. They are used in everything from cellular phones, eBook readers, GPS devices, computer monitors and automotive displays to projectors and TVs, to name but a few. This second edition continues to serve as an introductory guide to the fundamental properties of liquid crystals and their technical application, while explicating the recent advancements within LCD technology. This edition includes important new chapters on blue-phase display technology, advancements in LCD research significantly contributed to by the authors

themselves. This title is of particular interest to engineers and researchers involved in display technology and graduate students involved in display technology research. Key features: Updated throughout to reflect the latest technical state-of-the-art in LCD research and development, including new chapters and material on topics such as the properties of blue-phase liquid crystal displays and 3D liquid crystal displays; Explains the link between the fundamental scientific principles behind liquid crystal technology and their application to photonic devices and displays, providing a thorough understanding of the physics, optics, electro-optics and material aspects of Liquid Crystal Devices; Revised material reflecting developments in LCD technology, including updates on optical modelling methods, transmissive LCDs and tunable liquid crystal photonic devices; Chapters conclude with detailed homework problems to further cement an understanding of the topic.

Includes details of the fundamental phenomenological theories of solar cells, Li ion/ Li-air/Li-S batteries, fuel cells and their energy storage mechanisms. Discusses properties of various energy materials in addition to their device operation and evaluation.

Includes details of the fundamental phenomenological theories of solar cells, Li ion/ Li-air/Li-S batteries, fuel cells and their energy storage mechanisms Discusses properties of various energy materials in addition to their device operation and evaluation Liquid crystals have attracted scientific attention for potential applications in advanced devices. Display technology is continuously growing and expanding and, as such, this book provides an overview of the most recent advances in liquid crystals and displays. Chapters cover such topics as nematic liquid crystals, active matrix organic light-emitting diodes, and tetradentate platinum(II) emitters, among others.

Crystalline semiconductors in the form of thin films are crucial materials for many modern, advanced technologies in fields such as microelectronics, optoelectronics, display technology, and photovoltaic technology. Crystalline semiconductors can be produced at surprisingly low temperatures (as low as 120 °C) by crystallization of amorphous semiconductors, which are put in contact with a metal. This so-called metal-induced crystallization process has attracted great scientific and technological interest because it allows the production of crystalline semiconductor-based advanced devices at very low temperatures, for example, directly on low-cost (but often heat-sensitive) substrates. This book provides the first comprehensive and in-depth overview of the current fundamental understanding of the metal-induced crystallization process and further elucidates how to employ this process in different technologies, for example, in thin-film solar cells and display technologies. It aims to give the reader a comprehensive perspective of the metal-induced crystallization process and thereby stimulate the development of novel crystalline semiconductor-based technologies.

Active matrix liquid crystal displays (AMLCDs) are the preferred choice when thin, low power, high quality, and lightweight flat panel displays are required. Here is the definitive guide to the theory and applications of AMLCDs. Contemporary portable communication and computing devices need high image quality, light weight, thin, and low power flat panel displays. The answer to this need is the color active matrix liquid crystal display (AMLCD). The rides of AMLCD technology over less than two decades to undisputed dominance as a flat panel display has been breathtaking, and designers of portable devices need a thorough understanding of the theory and applications of AMLCDs. Willem den Boer, a holder of over 30 patents in imaging technologies, has created this guide to AMLCD theory, operating principles, addressing methods, driver circuits, application circuits, and alternate flat display technologies (including active matrix flat panel image sensors). Numerous design and applications examples illustrate key points and make them relevant to real-world engineering tasks. Need more information on Mobile Displays, go to: <http://www.insightmedia.info/newsletters.php#mdr> · Systematically discusses the principles of liquid crystal displays and active matrix addressing. · Describes methods of enhancing AMLCD image quality. · Extensive coverage of AMLCD manufacturing techniques. · Thorough examination of performance characteristics and specifications of AMLCDs.

This book highlights the display applications of c-axis aligned crystalline indium–gallium–zinc oxide (CAAC-IGZO), a new class of oxide material that challenges the dominance of silicon in the field of thin film semiconductor devices. It is an enabler for displays with high resolution and low power consumption, as well as high-productivity manufacturing. The applications of CAAC-IGZO focus on liquid crystal displays (LCDs) with extremely low power consumption for mobile applications, and high-resolution and flexible organic light-emitting diode (OLED) displays, and present a large number of prototypes developed at the Semiconductor Energy Laboratory. In particular, the description of LCDs includes how CAAC-IGZO enables LCDs with extremely low refresh rate that provides ultra-low power consumption in a wide range of use cases. Moreover, this book also offers the latest data of IGZO. The IGZO has recently achieved a mobility of 65.5 cm²/V-s, and it is expected to potentially exceed 100 cm²/V-s as high as that of LTPS. A further two books in the series will describe the fundamentals of CAAC-IGZO, and the application to LSI devices. Key features: • Introduces different oxide semiconductor field-effect transistor designs and their impact on the reliability and performance of LCDs and OLED displays, both in pixel and panel-integrated driving circuits. • Reviews fundamentals and presents device architectures for high-performance and flexible OLED displays, their circuit designs, and oxide semiconductors as an enabling technology. • Explains how oxide semiconductor thin-film transistors drastically can improve resolution and lower power consumption of LCDs.

Compared to traditional electrical filaments, arc lamps, and fluorescent lamps, solid-state lighting offers higher efficiency, reliability, and environmentally friendly technology. LED / solid-state lighting is poised to take over conventional lighting due to cost savings—there is pretty much no debate about this. In response to the recent activity in this field, *Fundamentals of Solid-State Lighting: LEDs, OLEDs, and Their Applications in Illumination and Displays* covers a range of solid-state devices, technologies, and materials used for lighting and displays. It also examines auxiliary but critical requirements of efficient applications, such as modeling, thermal management, reliability, and smart lighting. The book discusses performance metrics of LEDs such as efficiency, efficacy, current–voltage characteristics, optical parameters like spectral distribution, color temperature, and beam angle before moving on to luminescence theory, injection luminescence, radiative and non-radiative recombination mechanisms, recombination rates, carrier lifetimes, and related topics. This lays down the groundwork for understanding LED operation. The book then discusses energy gaps, light emission, semiconductor material, special equipment, and laboratory facilities. It also covers production and applications of high-brightness LEDs (HBLEDs) and organic LEDs (OLEDs). LEDs represent the landmark development in lighting since the invention of electric lighting, allowing us to create unique, low-energy lighting solutions, not to talk about their minor maintenance expenses. The rapid strides of LED lighting technology over the last few years have changed the

dynamics of the global lighting market, and LEDs are expected to be the mainstream light source in the near future. In a nutshell, the book traces the advances in LEDs, OLEDs, and their applications, and presents an up-to-date and analytical perspective of the scenario for audiences of different backgrounds and interests.

Focusing on polarization matrix optics in many forms, this book includes coverage of a wide range of methods which have been applied to LCD modeling, ranging from the simple Jones matrix method to elaborate and high accuracy algorithms suitable for off-axis optics. Researchers and scientists are constantly striving for improved performance, faster response times, wide viewing angles, improved colour in liquid crystal display development, and with this comes the need to model LCD devices effectively. The authors have significant experience in dealing with the problems related to the practical application of liquid crystals, in particular their optical performance. Key features: Explores analytical solutions and approximations to important cases in the matrix treatment of different LC layer configurations, and the application of these results to improve the computational method Provides the analysis of accuracies of the different approaches discussed in the book Explains the development of the Eigenwave Jones matrix method which offers a path to improved accuracy compared to Jones matrix and extended Jones matrix formalisms, while achieving significant improvement in computational speed and versatility compared to full 4x4 matrix methods Includes a companion website hosting the authors' program library LMOPTICS (FORTRAN 90), a collection of routines for calculating the optical characteristics of stratified media, the use of which allows for the easy implementation of the methods described in this book. The website also contains a set of sample programs (source codes) using LMOPTICS, which exemplify the application of these methods in different situations

How we interface and interact with computing, communications and entertainment devices is going through revolutionary changes, with natural user inputs based on touch, voice, and vision replacing or augmenting the use of traditional interfaces based on the keyboard, mouse, joysticks, etc. As a result, displays are morphing from one-way interface devices that merely show visual content to two-way interaction devices that provide more engaging and immersive experiences. This book provides an in-depth coverage of the technologies, applications, and trends in the rapidly emerging field of interactive displays enabled by natural human interfaces. Key features: Provides a definitive reference reading on all the touch technologies used in interactive displays, including their advantages, limitations, and future trends. Covers the fundamentals and applications of speech input, processing and recognition techniques enabling voice-based interactions. Offers a detailed review of the emerging vision-based sensing technologies, and user interactions using gestures of hands, body, face, and eye gazes. Discusses multi-modal natural user interface schemes which intuitively combine touch, voice, and vision for life-like interactions. Examines the requirements and technology status towards realizing "true" 3D immersive and interactive displays.

Display technology is evolving at an impressive rate with LCD and flat panel technologies gaining an increasing market share over traditional CRT display applications. Focusing on the development of new industry standards, this timely exposition of display systems and applications covers display timings, interfaces, specifications, measurement procedures and all forms of display control and identification. Reviews interface and graphics subsystem standards, including FPGI (Flat Panel Display Interface), P&D (Plug and Display) and Intel's Digital Video Interface (DVI) Compares and contrasts current and future developments of television and computer industry standards Describes the major new display system applications (HDTV, notebook computer, cellphone, cockpit instrumentation etc) and illustrates how user needs have dictated technological requirements (eg power, size and bistability) Provides an accessible treatment of current and future display device development, including guidance on selecting devices for particular applications

Designed to meet the needs of professionals using and implementing display technologies and as a reference for those developing new display systems, this text is a valuable resource for display technology developers and system integrators, video graphics interface engineers and professionals. The comprehensive coverage of this leading edge topic makes it also of interest to postgraduate students in Computer Science and Electrical Engineering. The Society for Information Display (SID) is an international society, which has the aim of encouraging the development of all aspects of the field of information display. Complementary to the aims of the society, the Wiley-SID series is intended to explain the latest developments in information display technology at a professional level. The broad scope of the series addresses all facets of information displays from technical aspects through systems and prototypes to standards and ergonomics

The Encyclopedia of Modern Optics, Second Edition, provides a wide-ranging overview of the field, comprising authoritative reference articles for undergraduate and postgraduate students and those researching outside their area of expertise. Topics covered include classical and quantum optics, lasers, optical fibers and optical fiber systems, optical materials and light-emitting diodes (LEDs). Articles cover all subfields of optical physics and engineering, such as electro-optical design of modulators and detectors. This update contains contributions from international experts who discuss topics such as nano-photonics and plasmonics, optical interconnects, photonic crystals and 2D materials, such as graphene or holy fibers. Other topics of note include solar energy, high efficiency LED's and their use in illumination, orbital angular momentum, quantum optics and information, metamaterials and transformation optics, high power fiber and UV fiber lasers, random lasers and bio-imaging. Addresses recent developments in the field and integrates concepts from fundamental physics with applications for manufacturing and engineering/design Provides a broad and interdisciplinary coverage of specialist areas Ensures that the material is appropriate for new researchers and those working in a new sub-field, as well as those in industry Thematically arranged and alphabetically indexed, with cross-references added to facilitate ease-of-use

Due to its unique properties, graphene oxide has become one of the most studied materials of the last decade and a great variety of applications have been reported in areas such as sensors, catalysis and biomedical applications. This comprehensive volume systematically describes the fundamental aspects and applications of graphene oxide. The book

is designed as an introduction to the topic, so each chapter begins with a discussion on fundamental concepts, then proceeds to review and summarize recent advances in the field. Divided into two parts, the first part covers fundamental aspects of graphene oxide and includes chapters on formation and chemical structure, characterization methods, reduction methods, rheology and optical properties of graphene oxide solutions. Part Two covers numerous graphene oxide applications including field effect transistors, transparent conductive films, sensors, energy harvesting and storage, membranes, composite materials, catalysis and biomedical applications. In each case the differences and advantages of graphene oxide over its non-oxidised counterpart are discussed. The book concludes with a chapter on the challenges of industrial-scale graphene oxide production. Graphene Oxide: Fundamentals and Applications is a valuable reference for academic researchers, and industry scientists interested in graphene oxide, graphene and other carbon materials.

Whilst inkjet technology is well-established on home and small office desktops and is now having increasing impact in commercial printing, it can also be used to deposit materials other than ink as individual droplets at a microscopic scale. This allows metals, ceramics, polymers and biological materials (including living cells) to be patterned on to substrates under precise digital control. This approach offers huge potential advantages for manufacturing, since inkjet methods can be used to generate structures and functions which cannot be attained in other ways. Beginning with an overview of the fundamentals, this book covers the key components, for example piezoelectric print-heads and fluids for inkjet printing, and the processes involved. It goes on to describe specific applications, e.g. MEMS, printed circuits, active and passive electronics, biopolymers and living cells, and additive manufacturing. Detailed case studies are included on flat-panel OLED displays, RFID (radio-frequency identification) manufacturing and tissue engineering, while a comprehensive examination of the current technologies and future directions of inkjet technology completes the coverage. With contributions from both academic researchers and leading names in the industry, Inkjet Technology for Digital Fabrication is a comprehensive resource for technical development engineers, researchers and students in inkjet technology and system development, and will also appeal to researchers in chemistry, physics, engineering, materials science and electronics.

The challenge for producing “invisible” electronic circuitry and opto-electronic devices is that the transistor materials must be transparent to visible light yet have good carrier mobilities. This requires a special class of materials having “contra-indicated properties” because from the band structure point of view, the combination of transparency and conductivity is contradictory. Structured to strike a balance between introductory and advanced topics, this monograph juxtaposes fundamental science and technology / application issues, and essential materials characteristics versus device architecture and practical applications. The first section is devoted to fundamental materials compositions and their properties, including transparent conducting oxides, transparent oxide semiconductors, p-type wide-band-gap semiconductors, and single-wall carbon nanotubes. The second section deals with transparent electronic devices including thin-film transistors, photovoltaic cells, integrated electronic circuits, displays, sensors, solar cells, and electro-optic devices. Describing scientific fundamentals and recent breakthroughs such as the first “invisible” transistor, Transparent Electronics: From Synthesis to Applications brings together world renowned experts from both academia, national laboratories, and industry.

The field of organic and printed electronics is well established in terms of academic, scientific, and technological research but is still an emerging one in terms of mass industrial applications such as OLED displays and lighting and organic photovoltaics. This book provides a comprehensive introduction to organic and printed electronics, their fundamental aspects, core technologies, and applications, and it is the first book of its kind specifically designed to address students in their final undergraduate or beginning graduate studies, as well as engineers interested in approaching this field.

Explains the fundamentals and practical applications of flat and flexible OLEDs for displays and lighting Organic light-emitting diodes (OLEDs) have emerged as the leading technology for the new display and lighting market. OLEDs are solid-state devices composed of thin films of organic molecules that create light with the application of electricity. OLEDs can provide brighter, crisper displays on electronic devices and use less power than conventional light-emitting diodes (LEDs) or liquid crystal displays (LCDs) used today. This book covers both the fundamentals and practical applications of flat and flexible OLEDs. Key features: Covers all of the aspects necessary to the design and manufacturing of OLED displays and lighting. Explains the fundamental basic technologies and also related technologies which might contribute to the next innovation in the industry. Provides several indications for future innovation in the OLED industry. Includes coverage of OLED vacuum deposition type and solution type materials. The book is essential reading for early career engineers developing OLED devices and OLED related technologies in industrial companies, such as OLED device fabrication companies.

The Fundamentals and Applications of Light-Emitting Diodes: The Revolution in the Lighting Industry examines the evolution of LEDs, including a review of the luminescence process and background on solid state lighting. The book emphasizes phosphor-converted LEDs that are based on inorganic phosphors but explores different types of LEDs based on inorganic, organic, quantum dots, perovskite-structured materials, and biomaterials. A detailed description is included about the diverse applications of LEDs in fields such as lighting, displays, horticulture, biomedicine, and digital communication, as well as challenges that must be solved before using LEDs in commercial applications. Traditional light sources are fast being replaced by light-emitting diodes (LEDs). The fourth generation of lighting is completely dominated by LED luminaires. Apart from lighting, LEDs have extended their hold on other fields, such as digital communications, horticulture, medicine, space research, art and culture, display devices, and entertainment. The technological promises offered by LEDs have elevated them as front-runners in the lighting industry. Presents a concise overview of different types of light-emitting diodes (LEDs) based on inorganic phosphors, organic materials, quantum dots, perovskite-structured materials, and biomaterials Includes a discussion of current and emerging applications in lighting,

communications, horticulture, and medical fields Addresses fundamentals, luminescence mechanisms, and key optical materials, including synthesis methods

In the last decade, new displays have been developed at an ever-increasing pace: bulky cathode ray tubes have been replaced by flat panels and mobile phones, tablets, and navigation systems have proliferated. Seeing this explosion raises tantalizing questions about the future evolution of visual displays: Will printed displays be sold by the square yard and glued to the wall? Will disposable displays, powered by printed batteries and with built-in storage chips, talk to us from cereal boxes? Will we begin wearing display glasses that simulate any kind or number of virtual displays we would ever need? Will chip implants directly interface to our brains, eliminating the need for any displays at all? These and other questions are explored in *Displays: Fundamentals & Applications*, which describes existing and emerging display technology. The book begins by presenting the basics of wave optics, geometric optics, light modulation, visual perception, and display measures, along with the principles of holography. It then describes the technology and techniques behind projection displays, projector-camera systems, stereoscopic and autostereoscopic displays, computer-generated holography, and near-eye displays. In addition, the authors discuss how real-time computer graphics and computer vision enable the visualization of graphical 2D and 3D content. The text is complemented by more than 400 rich illustrations, which give readers a clear understanding of existing and emerging display technology.

Recent improvements in LED technology have made them as ubiquitous as cell phones. In fact, LEDs light up almost all cell phones screens. The technology's myriad applications and low energy use have made it nearly impossible to get through daily chores without coming in contact with LEDs. Probable advances include increased ability of the technology to support more efficient lighting and enhanced communications. With balanced coverage of the basics and future developments, *Introduction to Light Emitting Diode Technology and Applications* takes you on a tour of the LED evolution. The book begins with a brief history of the effort to enable the device that generates light through modern organic LEDs and reviews the fundamentals and principles of light prior to a detailed explanation of how LEDs generate different colors. After forming this basic foundation, the book examines the key LEDs in lighting and communications. It then discusses the latest opportunities and advancements in high brightness (HB) LED technology, solid state lighting, and handheld electronic applications. As we approach a new decade the role of LEDs is literally set to explode, with organic light emitting diodes emerging as a leading next generation technology for electronic displays and lighting. Challenges still exist, including light extraction, luminosity, and white light generation, not to mention non-technical obstacles such as IP disputes and the lack of standards. This book provides a foundation for resolving these issues and developing new applications for LEDs in the promising general illumination market.

Flexible displays are currently one of the most researched topics within the flat panel display community. They promise to change our display-centric world by replacing bulky rigid devices with those that are paper-thin and can be rolled away or folded up when not in use. The field of flexible flat panel displays is truly unique in the sense that it is interdisciplinary to the display community, combining basic principles from nearly all engineering and science disciplines. Organized to bring the reader from the component level, through display system and assembly, to the possible manufacturing routes *Flexible Flat Panel Displays*: * outlines the underlying scientific theory required to develop flexible display applications; * addresses the critical issues relating to the convergence of technologies including substrates, conducting layers, electro-optic materials and thin-film transistors; * provides guidance on flexible display manufacturing; and * presents market information and a chapter dedicated to future market trends of flexible flat panel displays. *Flexible Flat Panel Displays* is an essential tool for scientists, engineers, designers and business and marketing professionals working at all levels of the display industry. Graduate students entering the field of display technology will also find this book an excellent reference. The Society for Information Display (SID) is an international society, which has the aim of encouraging the development of all aspects of the field of information display. Complementary to the aims of the society, the Wiley-SID series is intended to explain the latest developments in information display technology at a professional level. The broad scope of the series addresses all facets of information displays from technical aspects through systems and prototypes to standards and ergonomics

This book describes the application of c-axis aligned crystalline In-Ga-Zn oxide (CAAC-IGZO) technology in large-scale integration (LSI) circuits. The applications include Non-volatile Oxide Semiconductor Random Access Memory (NOSRAM), Dynamic Oxide Semiconductor Random Access Memory (DOSRAM), central processing unit (CPU), field-programmable gate array (FPGA), image sensors, and etc. The book also covers the device physics (e.g., off-state characteristics) of the CAAC-IGZO field effect transistors (FETs) and process technology for a hybrid structure of CAAC-IGZO and Si FETs. It explains an extremely low off-state current technology utilized in the LSI circuits, demonstrating reduced power consumption in LSI prototypes fabricated by the hybrid process. A further two books in the series will describe the fundamentals; and the specific application of CAAC-IGZO to LCD and OLED displays. Key features: • Outlines the physics and characteristics of CAAC-IGZO FETs that contribute to favorable operations of LSI devices. • Explains the application of CAAC-IGZO to LSI devices, highlighting attributes including low off-state current, low power consumption, and excellent charge retention. • Describes the NOSRAM, DOSRAM, CPU, FPGA, image sensors, and etc., referring to prototype chips fabricated by a hybrid process of CAAC-IGZO and Si FETs.

Edited by a highly regarded scientist and with contributions from sixteen international research groups, spanning Asia and North America, *Rare Earth Coordination Chemistry: Fundamentals and Applications* provides the first one-stop reference resource for important accomplishments in the area of rare earth. Consisting of two parts, *Fundamentals and Applications*, readers are armed with the systematic basic aspects of rare earth coordination chemistry and presented with the latest developments in the applications of rare earths. The systematic introduction of basic knowledge, application technology and the latest developments in the field, makes this ideal for readers across both introductory and

specialist levels.

Across industries, firms vary broadly on how they operate with respect to their Research & Development (R&D) activities. This volume presents a holistic approach to evaluating the critical elements of R&D management, including planning, organization, portfolio management, project management, and knowledge transfer—by assessing R&D management from different sectors. Featuring empirical research and in-depth case studies from industries as diverse as medical imaging, electric vehicles, and cyber security, the authors identify common features of successful R&D management, despite fundamental differences, such as company size, number of employees, industry sector, and the R&D budget. In particular, they consider the implications for decision making with respect to resource allocation and investments, such as site selection, purchasing, and cross-departmental communication.

Microdisplays are displays requiring optical magnification and OLEDs (Organic Light-Emitting Diode) are self-emitting displays where each pixel includes a LED made of organic material, in general composed of small-molecule organic material. This title reviews in detail how OLED microdisplays are made as well as how they are used. All aspects from theory to application will be addressed: basic principles, display design, display fabrication, operation and performances, present and future applications. The book will be useful to anyone interested in this rapidly developing field, such as students or researchers, industry professionals (engineers, project leaders) in the field of display development/fabrication and display end-users.

This new edition specifically addresses the most recent and relevant developments in the design and manufacture of OLED displays Provides knowledge of OLED fundamentals and related technologies for applications such as displays and solid state lighting along with processing and manufacturing technologies Serves as a reference for people engaged in OLED research, manufacturing, applications and marketing Includes coverage of white + color filter technology, which has become industry standard technology for large televisions

A Comprehensive Source for Taking on the Next Stage of OLED R&D OLED Fundamentals: Materials, Devices, and Processing of Organic Light-Emitting Diodes brings together key topics across the field of organic light-emitting diodes (OLEDs), from fundamental chemistry and physics to practical materials science and engineering aspects to design and manufacturing factors. Experts from top academic institutions, industry, and national laboratories provide thorough, up-to-date coverage on the most useful materials, devices, and design and fabrication methods for high-efficiency lighting. The first part of the book covers all the construction materials of OLED devices, from substrate to encapsulation. For the first time in book form, the second part addresses challenges in devices and processing, including architectures and methods for new OLED lighting and display technologies. The book is suitable for a broad audience, including materials scientists, device physicists, synthetic chemists, and electrical engineers. It can also serve as an introduction for graduate students interested in applied aspects of photophysics and electrochemistry in organic thin films.

Organic and printed electronics can enable a revolution in the applications of electronics and this book offers readers an overview of the state-of-the-art in this rapidly evolving domain. The potentially low cost, compatibility with flexible substrates and the wealth of devices that characterize organic and printed electronics will make possible applications that go far beyond the well-known displays made with large-area silicon electronics. Since organic electronics are still in their early stage, undergoing transition from lab-scale and prototype activities to production, this book serves as a valuable snapshot of the current landscape of the different devices enabled by this technology, reviewing all applications that are developing and those can be foreseen.

[Copyright: 618455a7931a38dd9da610a449494ba4](#)