TOPICALITIES

Edited by Markéta Držková

CONTENTS

News & more

Recently ending EU-funded Horizon 2020 projects

Among the projects supported under Horizon 2020 programmes and closed during past months belong, for example, the innovation actions FiberEUse that contributed to a circular economy through the reuse of end-of-life composites reinforced by glass or carbon fibres, e.g., in UV-assisted 3D printing or using 3D-printed moulds, and M3DLoC that was focused towards the pilot line producing 3D microfluidic detection devices using multi-material printing technologies, which also involved the development of biodegradable thermoplastic materials with suitable thermal and thermomechanical properties and solving the rheological issues of carbon-based inks, the research and innovation action REFREAM (re-thinking of fashion in research and artist collaborating development for urban manufacturing), which imployed 3D printing on textiles and resulted, among other outcomes, in new printer concepts, PRINT-CHEMO, funded through an individual fellowship, which aimed to develop 3D-bioprinted osteoinductive constructs for localised delivery of drugs for osteosarcoma, and much more. Details of the selected projects are given in the following sections.

MATERIALIZABLE – Intelligent fabrication-oriented computational design and modeling

This project, combining data-driven and physically-based modelling to provide both the required speed and accuracy, received the ERC Starting Grant and resulted in two dissertations and over twenty articles dealing, for example, with the computational design of nanostructural colour, geometry-aware scattering compensation, and measurement of volume transport parameters in solid photopolymer materials for 3D printing.

WEARPLEX – Wearable multiplexed biomedical electrodes

The publications resulting from this research and innovation action present the environmentally friendly conductive inks, high-performance screen-printed electrodes, monolithic integration of display driver circuits and displays manufactured by screen printing, design and fabrication of printed human skin model equivalent circuit, and more.

GREENSENSE – Sustainable, wireless, autonomous nanocellulose-based quantitative DoA biosensing platform

The scientific outcomes of this research and innovation action toward the Drug-of-Abuse analysis platform include the use of nanocellulose in printable ionogels for supercapacitors, water-based conductive inks with Ag nanoparticles for printed electronics and carbon ink for electrochromic displays and supercapacitors, as well as the studies assessing the environmental risk of nanocellulose and the knowledge of its human hazard potential.

Mag-ID – Magnetic identification

This innovation action aimed to develop a cost-effective and reliable system for high-volume tracking and tracing as an alternative to radio-frequency

Additive manufacturing using high-performance polymers for industrial applications

The technology was developed and patented by Cubicure, a company founded in 2015 as a spin-off of the TU Wien. The technology is named Hot Lithography and comprises stereolithography-based 3D printing at elevated temperatures. A special heating and coating mechanism allows the use of highly viscous, high-performance photopolymers enabling to achieve unique material properties of the manufactured components. The 3D-printing system is available in the compact version for processing prototypes or small series and the large-scale one for industrial series printing. The range of photopolymers offered by Cubicure includes materials for high-resolution components, flame-retardant or flame-resistant components, as well as highly flexible, elastic components.

In cooperation with the German company Hachtel, Hot Lithography was integrated into a complete procurement solution, from the digitalisation of the original part to optimisation and additive manufacturing of high-quality parts, up to the part qualification by industrial computer tomography. The project that aimed to bring to market the cost-efficient solution for additive manufacturing of components with material quality fulfilling industrial requirements was EU-funded through the SME Instrument. The related scientific publications describe the cationic ring-opening photopolymerisation of 2-oxazolines for direct UV-induced curing, the development of an ivory-like 3D printable material based on a dimethacrylic resin filled with calcium phosphate particles, and the synthesis of a new hybrid oligomer based on poly(propylene oxide) and its implementation as a migration-inhibited toughening agent and reactive diluent for viscous resins.

The Intergraf publications released during the past year

An updated version of the Intergraf recommendations on CO_2 emissions calculation in the printing industry (2.1) is available from September 2021. It identifies thirteen sources that are normally responsible for most CO_2 emissions and thus should be included in any calculation, no matter whether for a printing site or a printed product. These comprise the production of purchased inputs, namely substrates, energy, image carriers, such as plates and cylinders, inks, varnishes, toners and cartridges, packaging materials, isopropyl alcohol or similar additives and cleaning agents, combustion of fuels on-site and in company vehicles, transport of finished product and raw materials, employees commuting, production and transportation of fuels for on-site combustion, transportation and purchased energy production, including transmission losses.

Within the EU-funded project Print Your Future: Attracting a New Skilled Workforce for Quality Jobs in the European Graphic Industry, the publication How to Find, Attract and Keep the Next Generation: Best Practice Toolkit for the European Graphical Sector was released in November in eight languages. In spring, Intergraf published its annual activity and economic reports. The 2022 Intergraf Economic Report again provides the statistics relevant for the graphics industry in Europe and a collection of country reports on current trends. As each year, the list is a bit different. Besides the regularly contributing member federations from Bulgaria, Denmark, Germany, Italy, The Netherlands, Norway, and Portugal, the data for this edition were provided by Estonia, Latvia and the United Kingdom. Newly, it reviews the current paper supply disruptions, covering the paper industry profile, production and consumption of paper, price developments, graphic paper capacity, and the European reliance on paper, pulp and wood from Russia. Also, it includes the European print market review for 2021–2026 contributed by Smithers.

identification. The solution for product identification and verification of its authenticity utilises the sensing technology based on the tunnel magnetoresistance effect. The project results include optimised magnetic barcodes, new sensors with sensitivity higher than that of the existing magnetic ink sensors, the swipe reader and the one-shot reader, along with the firmware and communication interfaces. Another outcome is the report assessing the digital printers as well as physical characteristics and magnetic components of inks concerning their suitability for the production of printed magnetic barcodes.

DecoChrom – Decorative applications for self-organized molecular electrochromic systems

This innovation action demonstrated various applications of printed electrochromic components, such as the electrochromic running shoe, weather or dishwasher status display, a Qi wireless charger with an integrated power bank, interactive work board, modular wall panels, and ambient display with controllable shadow projection.

EnABLES – European infrastructure powering the Internet of Things

This research and innovation action joined several European research institutes and knowledge hubs of excellence to advance energy harvesting, storage and micropower management solutions for the integrated design and deployment of miniaturised autonomous sensors. The dozens of related publications cover, among other topics, screen-printable flexible textile-based ultra-broadband millimetre-wave DC-blocking transmission lines and fully printed components – inverters and electrolyte-gated oxide transistors.

IMPETUS – Pilot line for paper based electrochemical test strips dedicated to quantitative biosensing in liquids

The pilot line for the inline production of various sensors and actuators within this research and innovation action was equipped with the units for screen printing, flexographic printing, inkjet printing, chip placement and three drying options. Also, the project involved the design and development of all necessary materials and components.

WASP – Wearable applications enabled by electronic systems on paper

The publications resulting from this research and innovation action present, for example, the battery-free wireless photosensor with screen-printed graphene antenna and inkjet-printed WS_2 photodetector, printed solar cells, energy storage devices and field-effect transistors, and characterisation of Hall mobility and low-frequency noise of inkjet-printed graphene.

SELFSENS – Printed self-power platform for gas sensing monitoring

The scope of this project supported through a fellowship was broader than its title suggests, as illustrated by the resulting publications that describe the over-stretching tolerant conductors from silver nanoparticles deposited on rubber films by inkjet printing, printed and flexible microheaters based on carbon nanotubes, carbon dots as sensing layer for printed humidity and temperature sensors, the chipless wireless temperature sensor and the security button for radio frequency identification tags produced by screen printing, recent advances in printed capacitive sensors, and more.

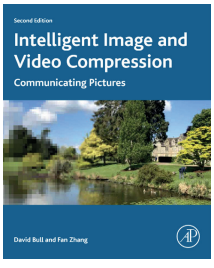
Bookshelf

Intelligent Image and Video Compression
Communicating Pictures

The scope of this book is much broader than the intelligent compression methods for visual information themselves. In an accessible style, the authors give a comprehensive account of the development in this area as well as many related concepts and put the described techniques in the context of recent trends, current requirements and expected future outlook. This edition reflects the progress made since the original book published in 2014, Communicating Pictures by D. Bull. It includes, in particular, the video compression requirements associated with more immersive applications and the corresponding format extensions, new approaches to perceptual quality assessment and measuring engagement, recently available databases with more comprehensive datasets, the importance of machine learning algorithms and resulting recent innovations, new techniques and standards supporting dynamic adaptive streaming, and the key attributes of the recently emerged video coding standards.

After the introduction explaining the need for compression and the basics, the book describes the human visual system and perception, provides the fundamentals of signal processing and information theory, and outlines digital picture formats and representations, including the concepts of gamma correction, colour spaces and quality metrics. The next three chapters deal with image and video coding transforms, filter-banks and wavelet compression, and lossless compression methods. Their content covers, among others, the basic principles and transforms, optimal transforms, the discrete cosine transform, the short-time Fourier transform and the Gabor transform, multi-rate filtering, bit allocation, hierarchical coding, symbol formation and encoding, Huffman, Golomb and arithmetic coding, as well as the JPEG and JPEG2000 standards, and provides performance comparisons. The eighth chapter discusses motion prediction for coding moving pictures; it explains temporal correlation and presents motion models, motion estimation methods and motion vector coding. The ninth chapter details the block-based hybrid video codec, which employs intraframe prediction, subpixel and multiple-reference frame motion estimation, variable-sized transforms and in-loop deblocking operations. The following chapter is dedicated to measuring and managing picture quality. Then, one chapter presents considerations for delivery across networks together with the available solutions, including robust coding strategies, error concealment and congestion management, and another one brings an overview of video coding standards and formats. In the last chapter, the authors reflect on the future challenges and outlook, with new formats and compression approaches.

The text is complemented by illustrations, algorithms, glossary, tutorial problems and additional resources, including tutorial solutions and interactive demonstration software, available online.



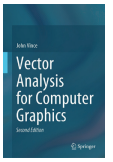
Authors: David R. Bull, Fan Zhang

Publisher: Academic Press
2nd ed., April 2021
ISBN: 978-0-12-820353-8
608 pages
Softcover
Available also as an eBook

Vector Analysis for Computer Graphics

Author: John Vince

Publisher: Springer
2nd ed., June 2021
ISBN: 978-1447175049
259 pages, 141 images
Hardcover
Also as an eBook



Although this new edition has eleven chapters as the first one, its content is restructured to a large extent; several topics are elaborated on in more detail, some were left out, while some are new. After an outline of the vector analysis history, the book presents linear equations, vector algebra, products of vectors, vector-valued functions, vector differential operators, and computation of tangent and normal vectors. Then, two chapters introduce equations for straight lines and the plane, followed by the chapter dealing with intersections. The last chapter is dedicated to three ways of rotating vectors, including the use of Hamilton's quaternions (see this section in JPMTR Vol. 11, No. 1).

Media and Management

Authors: Rutvica Andrijasevic, Julie Y. Chen, Melissa Gregg, Marc Steinberg

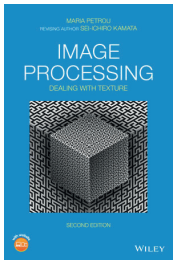
Publisher: University of Minnesota Press
1st ed., July 2021
ISBN: 978-1517912246
124 pages, 7 images
Softcover

The open-access digital edition of this publication is available from the Meson Press as a part of the In Search of Media series, which is a collaboration between the two publishers. This book explores the mutual relationship between media and management, with management innovations learned through media and media formats producing management opportunities. The introduction examines the management and its mediation. Also, it presents the just-in-time

Image Processing
Dealing with Texture

The first edition, written by M. Petrou and P. García Sevilla with both novice and more advanced readers in mind and presenting the texture as a major part of image processing, comprises a comprehensive guidebook to texture analysis techniques. This new edition revised by S. Kamata reflects the development in this area since the original publication in 2006. The companion website now provides MATLAB codes instead of executable programs.

The content remained organised into three main chapters dealing with the binary textures, stationary grey texture images, and non-stationary grey texture images. The first of them introduces shape grammars used to describe the regular binary textures as well as Boolean models and mathematical morphology for the irregular ones. Almost 300 pages of the following chapter present image binarisation, greyscale mathematical morphology, extended coverage of fractals and multifractals, the updated content on image statistics, texture features based on the Fourier transform, Markov random fields, Gibbs distributions, and the newly added section on texture repair. The last chapter with over 400 pages is dedicated to grey images that contain more than one type of texture. It covers implications of the uncertainty principle in signal and image processing, Gabor functions, prolate spheroidal sequence functions, local phase features in a new section, wavelets, including the dual-tree complex wavelet transform, ridgelets and curvelets in two new sections, pattern recognition, Laws' masks, local binary patterns, the Wigner distribution, and the new content dealing with convolutional neural networks used for deep texture features extraction.



Authors: Maria M. P. Petrou, Sei-ichiro Kamata

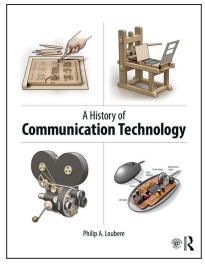
Publisher: Wiley
2nd ed., March 2021
ISBN: 978-1-119-61855-3
816 pages
Hardcover
Available also as an eBook

A History of Communication Technology

This new textbook intends to show a clear timeline of the significant inventions that brought about new means of communication and covers also the related concepts relevant for understanding the presented technologies. Besides explaining the working principle and providing the facts about their inventors, devices and machines used, etc., it also discusses the effects that each technology had on society and culture.

Author: Philip A. Loubere

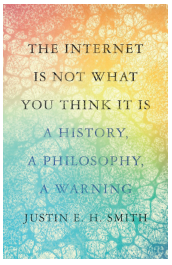
Publisher: Routledge
1st ed., April 2021
ISBN: 978-0-367-21149-3
310 pages
Hardcover
Available also as an eBook



After introducing the theme of the book and its aims, one chapter provides a brief overview of the milestones in human history and significant communication technologies that emerged sequentially in East Asia, Europe, and the United States. The following chapter reviews the period from prehistory to early history. Four chapters then track the development of writing, paper and printing, their improvements and the emergence of entirely new media during the industrial revolution and the Modern Era. Next, three chapters deal with industrial printing (not in its present meaning, but in terms of devices, machines, presses and other technologies used in the printing industry), photography and film, and electronic communication. The last chapter before the conclusion presents the core tools and concepts of the current digital age.

The Internet Is Not What You Think It Is
A History, a Philosophy, a Warning

The content of this new publication dealing with the internet is clearly outlined in its title. Building on his scholarly work, the author presents a novel interpretation of the internet origins, showing connections with nature and ideas formulated deep in history, and discusses many current and future aspects of the internet with thoughtful scepticism.



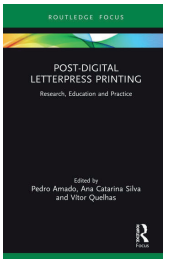
Author: Justin E. H. Smith

Publisher: Princeton University Press
1st ed., March 2022
ISBN: 978-0-691-21232-6
208 pages, 6 images
Hardcover
Available also as an eBook

Post-Digital Letterpress Printing
Research, Education and Practice

While the commercial potential of letterpress printing greatly diminished, the technology is again of interest in search for innovative approaches across different fields ranging from historical research to applications in education and design. This book collects the contributions of almost twenty authors who present the research on letterpress and the contemporary digital practices inspired by this traditional technology. The content is divided into three parts, each beginning with an introduction and containing the selected highlight, followed by three to four chapters presenting the case studies and projects exploring the contribution of letterpress to the fields of arts and design research, the relationship between letterpress practice and design education, and the current letterpress practices.

Editors: Pedro Amado, Ana C. Silva, Vítor Quelhas



Publisher: Routledge
1st ed., November 2021
ISBN: 978-1-03-200180-7
152 pages, 11 images
Hardcover
Available also as an eBook

approach and the platform as managerial concepts. Three main chapters elaborate on the mediation of management, demonstrated using the Toyota Production System example and reflected in Agile software development as well as the lean start-up movement, time-based management in on-demand electronics manufacturing, and the intersections of management and mediation of labour in the so-called platform economy. The concluding passage pays attention to the challenges and changes that arose due to COVID-19 and the geopolitic issues.

The History of Graphic Design
40th Ed.

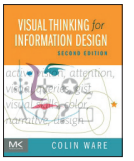
Author: Jens Müller
Editor: Julius Wiedemann

Publisher: Taschen
March 2022
Multilingual Edition:
English, French, German
ISBN: 978-3836588065
512 pages, Hardcover

This compact edition of a highly praised work tracing 13 decades of graphic design is a part of the series published by Taschen on the occasion of its 40th anniversary. The original two-volume edition in a large format is still available as well.

Visual Thinking
for Information Design

Author: Colin Ware

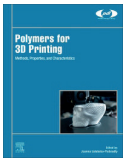


Publisher:
Morgan Kaufmann
2nd ed., March 2021
ISBN: 978-0128235676
224 pages, Softcover
Also as an eBook

This new edition is revised based on new findings, especially the theory of predictive cognition, which provides the framework for the new chapter discussing visualizations as a means for building mental models. For C. Ware's more extensive book on perception for design see this section in JPMTR Vol. 9, No. 3.

Polymers for 3D Printing Methods, Properties, and Characteristics

Editor: Joanna Izdebska-Podsiadły



Publisher:
William Andrew
1st ed., June 2022
ISBN: 978-0128183113
408 pages, Hardcover
Also as an eBook

Two parts of this book provide at first a general introduction to 3D printing and then more details of vat photopolymerisation, material extrusion and jetting, powder bed fusion, binder jetting, sheet lamination, and direct energy deposition 3D-printing methods. The third part presents the properties and attributes of polymers used in 3D printing – photopolymers, polymers in printing filaments, polymer powders, plastic pellets, films for sheet lamination, and polymers for 3D bioprinting. The book concludes with two chapters dealing with the global market structure and the trends and perspectives in 3D printing.

Novel Materials for Dye-containing Wastewater Treatment

Editors: Subramanian S. Muthu, Ali Khadir

Publisher: Springer
1st ed., July 2021
ISBN: 978-9811628917
236 pages, 80 images
Hardcover
Also as an eBook

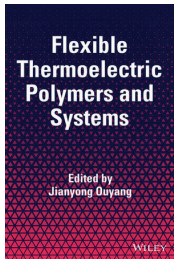
Focused on the topic important for many industries, including textile, food, paper, leather, rubber, cosmetics as well as printing, this book presents novel materials for the treatment of wastewater containing dyes together with other compounds, both inorganic and organic. Various biomaterials and nanocomposites, such as chitosan, luffa fibres, nanocellulose-based membranes and TiO_2-based composites, are among the materials considered promising to reduce health and environmental hazards.

Flexible Thermoelectric Polymers and Systems

After providing readers with the background on thermoelectric materials and their use, this book covers the recent developments in flexible thermoelectric polymeric and composite materials, their applications and novel designs helping to overcome the drawbacks concerning flexibility and cost of thermoelectric devices.

The first chapter describes the effects taking place in thermoelectric materials, their properties and applications in thermoelectric generators, Peltier coolers and thermoelectric sensors. The second one introduces the main types of conductive polymers, their mechanism, synthesis and doping, as well as their utilisation in flexible thermoelectric systems together with the processing techniques used for their production, which include screen printing and inkjet printing. The third chapter is focused on flexible thermoelectrics based on poly(3,4-ethylenedioxythiophene), produced e.g. by the stencil-printing technique, and the next chapter describes the flexible thermoelectric plastic fabricated by electrochemical deposition. The following two deal with the thermoelectric properties of conducting polymers with ionic conductors and composites of carbon nanomaterials in polymers. The last chapter is dedicated to low-dimensional thermoelectric materials.

Editor: Jianyong Ouyang

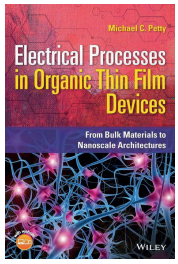


Publisher: Wiley
1st ed., February 2022
ISBN: 978-1-119-55070-9
272 pages
Hardcover
Available also as an eBook

Electrical Processes in Organic Thin Film Devices From Bulk Materials to Nanoscale Architectures

This book, which is intended primarily for advanced readers, first discusses electronic and vibrational states in organic solids and the limited applicability of the band theory. Then, it presents the fundamental principles of electrical conductivity, defects and nanoscale phenomena, ohmic and rectifying electrical contacts, the field effect in metal/insulator/semiconductor devices, DC and AC conductivity, as well as polarisation. Finally, it deals with organic field-effect transistors, electronic memory, light-emitting devices, photoconductive and photovoltaic devices, and also the emerging devices and systems, such as molecular logic circuits and various nature-inspired approaches, including organic neuromorphic devices, microtubule electronics, fault tolerance and self-repair, biochemical sensors, and more.

Author: Michael C. Petty



Publisher: Wiley
1st ed., January 2022
ISBN: 978-1-119-63127-9
480 pages
Hardcover
Available also as an eBook

Bookshelf

Academic dissertations

Development of Printed Computer Generated Holograms Reconstructing System

The focus of this thesis was on holography, which can be seen as a specific area of graphic technology. It provides a means of visualisation and communication of information combined with a very high level of product protection. In particular, the work dealt with the computer-generated holograms that can be manufactured in the required quality using the standard, commercially available graphic equipment to make the holographic technology more feasible and accessible, thus opening new applications. The approach was based on proper consideration of the technical capabilities of the selected printing technique, the correlation between digital and physical quantities, as well as possible negative effects when manipulating digital values. The corresponding input parameters were taken into account during the calculations, and the effects of both physical and digital parameters of fabrication on the quality of optical reconstruction were determined.

The dissertation explains the phenomena employed in hologram recording and reconstruction, i.e. the optical field, interference and diffraction, brings an overview of the classification and types of holograms, and presents the digital holography processes for computer generation and numerical reconstruction of holograms. It also describes the holographic security elements, including those utilising computer-generated holograms. The methods presented in the experimental part include the process of making a 3D point cloud model, the development of the mathematical model for hologram generation together with its implementation in a computer programme optimised for calculation speed, prepress setup for printing computer-generated holograms and a laboratory prototype for their reconstruction and authentication. The results are discussed in terms of the quality of optical reconstruction concerning print resolution, edge sharpness, optical density, raster tone value, positions of reference source and 3D model, sizes of the model and printed hologram, and the resulting security features.

Doctoral thesis – Summary

Author:
Vladimir Cviljušac

Speciality field:
Computer Graphics

Supervisor:
Nikola Mrvac

Defended:
3 September 2020, University of Zagreb, Faculty of Graphic Arts Zagreb, Croatia

Language:
Croatian

Original title:
Razvoj sustava rekonstrukcije tiskanih računalno generiranih holograma

Contact:
vladimir.cviljusac@grf.unizg.hr

Further reading:
http://eprints.grf.unizg.hr/id/eprint/3167

Development of a Robotic Cell for the Printing of Electronic Circuits on Free Form Surfaces and Industrial Applications

This thesis contributed to the development of systems for printing electronics onto the existing 3D objects. Although the demand in this area is growing and individual technologies, tools and materials are available, there is a lack of ready-made solutions suitable for prototyping and small-scale manufacturing. The work aimed to provide a versatile, easy-to-implement and cost-effective system for automated functionalisation of 3D objects by depositing electronic components on their surface. To accomplish this, a six-axis multi-tool industrial robot was equipped with the tools enabling scanning of the object to be functionalised and direct writing following a resulting trajectory, which is determined and transformed into the control programme using the dedicated, custom-made software. It was necessary to consider the sources of inaccuracy in the process, such as the representation of the object geometry and its position, select and integrate appropriate deposition techniques, and develop a protocol for controlling the robotic arm movements

Doctoral thesis – Summary

Author:
Gioia Furia

Speciality field:
Engineering Sciences

Supervisors:
Davide Beneventi
Didier Chaussy

Defended:
29 January 2021, LGP2, Grenoble INP Grenoble, France

Contact:
gioia.furia@cea.fr

during the patterning of conductive tracks. The other aspects taken into account included the speed optimisation and the ease of use for non-expert users. In addition, a method to predict the circuit morphology was proposed.

The dissertation is organised into three main chapters. The first one provides the background on the robotic arm and measuring equipment, relevant printing and annealing processes, and properties of inks and substrates. Further, it describes the moulded interconnect devices, additive manufacturing of 2D and 3D functional components, and using robotics in research and industrial applications. The second chapter details the development of the robotic cell and the software. It discusses the robot language, simulation and off-line programming tools, object data collection, mesh generation and optimisation, projecting and printing of electronic circuits, the complete setup of the printing robotic cell and the user interface. Finally, the third chapter presents the application of the cell in two projects. The study of printing on 3D objects included characterising printed lines, creating and validating a predictive model, and optimising the trajectory. In the second study, the system was used for the manufacturing of encapsulated microfluidic devices.

Further reading:
https://tel.archives-ouvertes.fr/tel-03228497

Doctoral thesis – Summary

Author:
Edgar Ricardo Nandayapa Bermudez

Speciality field:
Applied Physics

Supervisor:
Emil J. W. List-Kratochvil

Defended:
8 April 2021, Humboldt-Universität zu Berlin, Mathematisch-Naturwissenschaftliche Fakultät Berlin, Germany

Contact:
edgar.nandayapa@helmholtz-berlin.de

Metal Halide Perovskites: Photophysics and Inkjet Printing of Solar Cells

The research within this thesis dealt with metal halide perovskites, which are considered promising materials for the economic production of photovoltaic devices. While they show several advantageous properties and are comparable to silicon-based solar cells at a laboratory scale, some limitations impede their large-scale production for practical use and adoption into the consumer market. In particular, this work investigated the mechanisms that hinder the stability of perovskites in atmospheric conditions and explored the crystallisation process of metal halide perovskites deposited by inkjet printing in areas larger than one square inch.

First, the dissertation outlines fundamentals concerning the crystal structure of metal halide perovskites as well as their physical and chemical characteristics, the basic functioning of solar cells, their types, and the key features affecting their performance. It also describes the characterisation methods used for the investigations, focusing mainly on photoluminescence lifetime and quantum yield. Additionally, it examines the principles of inkjet printing and the requirements needed for depositing perovskite materials using this technique. One of the chapters focuses on the stability of perovskites in atmospheric conditions. Using photoluminescence spectroscopy, the charge transfer processes leading to a fast degradation and reduction of power conversion efficiency were studied by applying the Stern-Volmer model. Perovskite films were exposed to increasing concentrations of particular atmospheric gases, leading to a signature change of photoluminescence that can be used to elucidate how degradation is happening. These findings can help develop and apply specific passivation techniques to increase the stability of the solar cells. Another chapter is dedicated to the large-area deposition of metal halide perovskites by inkjet printing. It discusses typical defects encountered when printing perovskites, and how to mitigate them. Then, it presents the study using three different techniques to promote the crystal quality after printing. It was found that a single-step deposition of perovskite materials leads to a higher quality crystal. Furthermore, using a combination of vacuum conditions and a stream of nitrogen at low pressures resulted into the smoothest layers, a requirement for highly efficient solar cells.

Further reading:
DOI: 10.18452/23121

Events

NANOTEXNOLOGY 2022

Thessaloniki, Greece
2–9 July 2022

For the third time, this event is held in a hybrid format. The 16th International Summer Schools on Nanosciences & Nanotechnologies, Organic Electronics and Nanomedicine are offered on the weekend days that precede and follow the conference programme and the exhibition. Besides attending the common lectures and parallel sessions of the three summer schools, the participants can present their current research in a special ISSON22 Poster Session that this year features over 30 contributions. The four days of the 15th International Symposium on Flexible Organic Electronics offer over 50 invited lectures and eight keynotes, for example 'Organic electronics for a net zero carbon future sustainable society' by Ravi Silva, 'Non-radiative recombination in organic photovoltaics' by Koen Vandewal, 'Virtual screening for organic solar cells and light emitting diodes' by Denis Andrienko, 'Organic semiconductors: new opportunities in visible light communication' by Ifor Samuel, and 'Nanomanufacturing of sustainable circular electronics' by Thomas Anthopoulos. The plenary session features Paul Blom on 'Device operation of organic light-emitting diodes based on thermally activated delayed fluorescence', Lorenzo Moroni on 'Biofabrication in regenerative medicine: from textile scaffolds to bioprinting' and Jenny Nelson on 'Optimising solar energy conversion in molecular electronic materials'. The sessions of the 19th International Conference on Nanosciences & Nanotechnologies also span four days, while the 5th International Conference on 3D Printing & Bioprinting, AI, Digital & Additive Manufacturing, co-organised in the scope of six EU-funded Horizon 2020 projects, comprises three sessions in two days.

FLEPS 2022
4th IEEE International Conference on Flexible, Printable Sensors and Systems

Vienna, Austria
10–13 July 2022

This in-person event offers tutorials on the first day and three days of lectures in sessions dedicated to emerging materials, advanced manufacturing, physical sensors and smart systems, biosensors for advanced diagnostic applications, energy harvesting and storage, green and low-power electronics, hybrid integration and packaging, reliability, simulation and modelling, smart tags and communication devices, emerging applications, point-of-care diagnostics, brain-inspired computing, e-textile sensor systems, technology computer-aided design for micro/nanosystems, e-waste and sustainable electronics. The announced keynotes are 'Organic Semiconductors in Opto-electronic Devices' by Thuc-Quyen Nguyen, 'Ultra flexible elastic integrated circuit system for comprehensively monitoring brain activity' by Tsuyoshi Sekitani and 'Unconventional materials and platforms for stretchable transistor- and resistor-based sensors' by Antonio Facchetti.

8th Colour Management Symposium

Munich, Germany
6–7 July 2022

The slogan of this edition, which newly offers the option to join the event online via live stream, is 'Matching colour – Matching people'. On the first day, the schedule includes the topics of managing customer expectations in reality, modern colour workflows, including the case of using spot colour tone value for FOGRA51 stochastic printing, implementations of the expanded colour gamut in the printing of calendars and labels, and colour management for different applications of the high-speed inkjet printing. The keynote by Dimitris Mylonas, scheduled during the social event, deals with colour perception and colour naming in various languages, showing how to facilitate colour communication within and between cultures. The morning sessions of the second day focus on colour proofing and communication in packaging and textile printing. The last session discusses the future of colour management.

London Imaging Meeting 2022

London, UK
6–8 July 2022

In its third year, this event, held by the Society for Imaging Sciences and Technology with the Institute of Physics, takes place in person for the first time, with the option to attend online technical sessions. Four courses of the Summer School on Display Science are offered on 6 July. The keynote speakers are Steven M. LaValle presenting 'Foundations of perception engineering' and Robert Pepperell with the lecture 'The display of perception and the perception of displays'.

21st International Coating Science and Technology Symposium

Minneapolis, Minnesota, USA
11–14 September 2022

In 2022, the schedule of this biennial event includes parallel sessions dedicated to coating applications, design and manufacturing of flexible electronics, coating, drying and curing fundamentals, wetting, solidification and microstructure development.

XVII Color Conference

Florence, Italy
12–13 September 2022

The current edition of this conference held by the Italian Color Association is announced in a hybrid format. In the same venue, the 2nd edition of the Colour Photography and Film event takes place on 15–16 September.

ERA Annual Conference and the Packaging & Decorative Conference 2022

Baveno, Italy
21–23 September 2022

The programme for this year includes the study of the ecological impact and sustainability of the gravure process, the comparison of water-based and solvent-based inks, future alternative cylinder solutions, and other topics.

Other events in brief

Over two years after the outbreak of the COVID-19 pandemic, the organisers still face uncertainty. The 6th International Conference on Computer Graphics and Digital Image Processing had to be changed into a virtual event held on 9 July 2022, while The Print Show, postponed from 2020, is announced to take place in Birmingham, UK (20–22 September). Whereas High-Performance Graphics 2022 continues as a virtual conference (11–14 July), SIGGRAPH takes place virtually and in Vancouver, Canada (8–11 August 2022).

FLEX 2022

San Francisco, California, USA
11–14 July 2022

This edition of FLEX entitled 'Electronics in Motion' is co-located with SEMICON West, covering the advances across the microelectronics supply chain. The events are held in a hybrid format, with virtual access available until 13 August 2022. The FLEX opens with the keynotes 'Electrophoretic display technology will change the look of automobiles, transportation and beyond' by Michael D. McCreary, 'IARPA's SMART ePANTS program – weaving electronics into textiles' by Dawson Cagle and 'Multilayer flexible electronic devices for IoT and RF applications' by John D. Williams. Then, the FLEXTalks focus on custom, rapid manufacturing of batteries, gravure offset versatility, transparent antennas and heaters with copper micro-wire, and scalable 3D-printed electronics. The technical sessions cover flexible hybrid electronics market outlook, various applications, materials, printing, processing and integration, reliability and inspection, sustainability, and more.

SPIE Optics & Photonics 2022

San Diego, California, USA
21–25 August 2022

This multidisciplinary event is this year held again in person. The rich programme presents, among other topics, the research involving printing, dealing with the flexible transistor based on carbon nanotubes, high-density temperature sensor array, flexible and large-scale Bragg mirrors, sensors for toxic, flammable, and atmospheric gases, and other applications.

Textile Printing & Sustainability Conference 2022

Düsseldorf-Neuss, Germany
8–9 September 2022

This new ESMA event covers the textile printing technology from materials, systems and their components to different aspects of workflow automation, applications in various sectors from home textiles to workwear, up to smart textiles, as well as the topics related to sustainability, such as water and energy consumption, circular economy and successful business models.

48th iarigai and 53rd International Circle Conferences

Greenville, South Carolina, USA
19–21 September 2022

After being successfully held in Europe, the joint conference of the International Association of Research Organizations for the Information, Media and Graphic Arts Industries and the International Circle of Educational Institutes of Graphic-Media Technology and Management is this year hosted by the Clemson University with the theme 'Print Travels'. The participants can attend the lectures of both events, the 48th International research conference of iarigai, Advances in Printing and Media Technology, and the 53rd Conference of the IC, Graphic Communication Education – Future Orientations.