

FRONTIERS IN MATERIALS MANUFACTURING

MATERIALS FOR PRINTED HYBRID ELECTRONICS PROFILES

May 19, 2021

John Ahn

Business Development Executive, Argonne National Laboratory



John has a passion for innovation and bringing new technologies to the market. John has worked in commercial and R&D roles. He has led business development and sales for hydrogen and fuel cell markets, working with start-ups and large companies around the world. John has also led development of new technologies for the chemicals and crop protection business at Monsanto.

John excels at exploring the needs of customers in the B2B technology space and translating those insights into R&D programs to launch new products.

John holds an MBA from INSEAD, a PhD in Chemical Engineering from Technical University of Munich, and a MS from the University of California, Berkeley.



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Matthew Dyson

Technology Analyst, IDTechEx
Panelist Moderator



Dr. Matthew Dyson is a Technology Analyst at IDTechEx, specializing in printed/organic/flexible/hybrid electronics.

Matthew has previously been involved in academic research across a wide range of printed/flexible electronics topics, contributing to 15 scientific papers in well-respected journals and obtaining an h-index of 8. As such he has a comprehensive understanding across the printed/organic/flexible electronics field. Matthew analyses technical innovations and applications across the printed/organic/flexible/hybrid landscape, publishing his analysis on the IDTechEx portal and in reports.

Matthew has a BSc Joint Honors in Physics and Chemistry from Durham University, providing a broad understanding across both disciplines. After a PGCE and two years teaching physics in London he returned to academia, completing an MRes (with distinction) and PhD in Physics from Imperial College London. This research aimed to better establish processing/structure/property relationships in conjugated polymers, particularly in the context of insulator blends, and was conducted within Imperial College's Centre for Plastic Electronics that spans the Chemistry, Physics and Materials Science departments. More recently, Matthew was a post-doctoral researcher at Eindhoven Technical University as part of an EU funded Innovative Training Network (ITN), focusing primarily on organic photodetectors (OPDs) and sub-bandgap states in conjugated polymers. His research has also included work on hybrid perovskite photovoltaics/photovoltaics and aggregation induced emission materials.



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Eric Forsythe

Program Manager, NextFlex Manufacturing Institute, Army Research Laboratory
Panelist Moderator



Eric Forsythe is a Staff Physicist at the CCDC-Army Research Laboratory executing the Office of the Secretary of Defense funded NextFlex Manufacturing Institute and is the Technical Lead of ARL's Hybrid Electronics Research under an Essential Research Program. Prior to assuming these responsibilities in 2015, he executed several public-private partnerships supporting DOD and commercial transitions, to include; the US Army Flexible Display Center and the SEMI FlexTech Alliance programs. These two programs contributed to the acceleration of flexible display manufacturing technologies for commercial and DoD applications. In 2011, the flexible display development transitioned to flexible x-ray imagers for explosive ordnance disposal DoD applications. Flexible x-ray imagers have successfully transitioned to DoD applications. In his current role as the NextFlex program manager, he is developing hybrid electronics manufacturing for electronic assembly and packaging to support DoD's Modernization Priorities. As the ARL Technical Lead, he is translating ARL internal research to industrial relevant results through these public-private partnerships.

Prior to joining the Army Research Laboratory, he was a Post-Doctoral Fellow at the University of Rochester Physics and Chemistry Departments studying interfaces in organic light emitting diodes. In the position, he worked closely with Eastman Kodak, and the inventors of the OLED display technology.

He earned his B.S. in Engineering Physics (E.E. concentration) at the University of Maine, Orono and Ph.D. in Physics from Stevens Institute of Technology and has more than 75 publications (H-index of 22) and 9 patents issued or filed. Over the years, he served on numerous Professional Society committees.



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Stijn Gillissen

Global Head Printed Electronics, Henkel



Stijn Gillissen is the global head for printed electronics at Henkel. Among many others, Henkel is a market leader for material solutions in printed electronics and aims to build partnership networks to make any application using printed electronics a success. After completing his Ph.D. in polymer and organic chemistry, Stijn started his professional career at Henkel 18 years ago as a chemist designing new material solutions (adhesives, coatings and inks) used in the assembly of electronic devices. Since then he held positions in global technology management, strategic marketing and business development in the electronic adhesive division of Henkel.



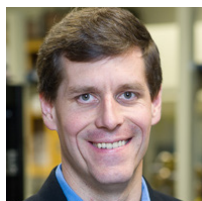
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Mark Hersam

*Walter P. Murphy Professor of Materials Science and Engineering,
Northwestern University*



Mark C. Hersam is the Walter P. Murphy Professor of Materials Science and Engineering and Director of the Materials Research Center at Northwestern University. He also holds

faculty appointments in the Departments of Chemistry, Applied Physics, Medicine, and Electrical Engineering. His research interests include nanomaterials, nanomanufacturing, scanning probe microscopy, nanoelectronic devices, biosensors, and renewable energy. Dr. Hersam has received several honors including the Presidential Early Career Award for Scientists and Engineers, TMS Robert Lansing Hardy Award, AVS Peter Mark Award, MRS Outstanding Young Investigator, U.S. Science Envoy, MacArthur Fellowship, AVS Medard W. Welch Award, and eight Teacher of the Year Awards. An elected member of the National Academy of Inventors, Dr. Hersam has founded two companies, NanoIntegris and Volexion, which are commercial suppliers of nanoelectronic and battery materials, respectively. Dr. Hersam is a Fellow of MRS, AVS, APS, AAAS, SPIE, and IEEE, and also serves as an Associate Editor of ACS Nano.

He earned a B.S. in Electrical Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 1996, M.Phil. in Physics from the University of Cambridge (UK) in 1997, and a Ph.D. in Electrical Engineering from UIUC in 2000.

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Melbs LeMieux

Co-Founder and President, Electroninks

Dr. Melbs LeMieux is an expert on thin films and nanomaterials, including thin film materials science, with emphasis in polymeric, composite, electronic materials, and conductive ink formulations. Dr. LeMieux is also active in technology commercialization and has a strong interest in enabling the development and realization of technologies and products incorporating advanced materials for the consumer electronics and medical industries. His background includes direct experience in product and technology development in applications related to display and printed electronics. In 2010 while a postdoctoral fellow at Stanford, he cofounded C3Nano, Inc., developing solution processed transparent electrodes for display and touch panel devices. From 2010 – 2014, he helped guide the company in winning the MIT Clean Energy Prize and growing into a world-wide market leader in providing materials for flexible electronics. He went on to cofound Electroninks, Inc., which develops materials for consumer electronics, as well as its own consumer product line sold into international educational markets, CircuitScribe.

Dr. LeMieux received his Ph.D. in materials science and engineering from Iowa State University, with emphasis on polymer physics and interfaces, under the mentorship of Prof. Vladimir Tsukruk. From there, he was awarded an IC Postdoctoral Fellowship and worked with Prof. Zhenan Bao at Stanford University in Chemical Engineering where we developed low profile organic flexible electronic devices. His areas of research included organic electronics, carbon nanotube enabled electronics, carbon nanotube sensors, and flexible and transparent electronic materials. Melbs has co-authored over 40 publications and over 70 patents applied or granted.



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Matthew Tirrell

*Dean of the Pritzker School of Molecular Engineering and
Robert A. Millikan Distinguished Service Professor, University of Chicago;
Senior Scientist, Argonne National Laboratory*



Matthew Tirrell is the dean of the Pritzker School of Molecular Engineering (PME) and the Robert A. Millikan Distinguished Service Professor at the University of Chicago. His personal

research specializes in the manipulation and measurement of polymer surface properties. His work has provided new insight into phenomena such as adhesion, friction, and biocompatibility, and contributed to the development of new materials based on self-assembly of synthetic and bio-inspired materials.

Before becoming dean of Pritzker Molecular Engineering in 2011, Matthew served as the Arnold and Barbara Silverman Professor and chair of the Department of Bioengineering at the University of California, Berkeley, and as professor of materials science and engineering and chemical engineering and faculty scientist at Lawrence Berkeley National Laboratory. Prior to that, he was dean of engineering at the University of California, Santa Barbara for 10 years. Matthew began his academic career at the University of Minnesota as an assistant professor in the Department of Chemical and Materials Engineering and later became head of the department. He also served as Deputy Laboratory Director for Science at Argonne National Laboratory, where he was responsible for integrating the laboratory's research and development efforts and science and technology capabilities.

Matthew received his BS in chemical engineering from Northwestern University and his PhD in polymer science and engineering from the University of Massachusetts. He has received many honors, including the Polymer Physics Prize of the American Physical Society and election to the National Academy of Sciences, National Academy of Engineering, and the American Academy of Arts and Sciences.



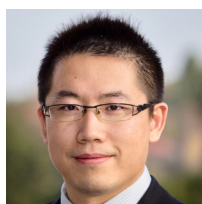
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Sihong Wang

Assistant Professor of Molecular Engineering, University of Chicago



Sihong Wang is an Assistant Professor in the Pritzker School of Molecular Engineering at the University of Chicago, USA.

From 2015 to 2018, he was a postdoctoral fellow with Prof. Zhenan Bao in Chemical Engineering at Stanford University. He has published over 60 papers in numerous high-impact journals, including Nature, Science, Nature Materials, Nature Electronics, Nature Communications, Science Advances, Advanced Materials, Energy & Environmental Science, etc. His research group currently focuses on soft polymeric bioelectronic materials and devices as the new generation of technology for biomedical studies and practices. As of April 2021, his research has been cited more than 14,500 times and he has an H-index of 55. He was recognized as a Highly Cited Researcher by Clarivate Analytics in 2020, and was awarded MIT Technology Review 35 Innovators Under 35 (TR35 Global List), MRS Graduate Student Award, Chinese Government Award for Outstanding Students Abroad, Top 10 Breakthroughs of 2012 by Physics World, etc.

He received his PhD degree in Materials Science and Engineering from the Georgia Institute of Technology in 2014 under the supervision of Prof. Zhong Lin Wang, and his Bachelor's degree from Tsinghua University in 2009.

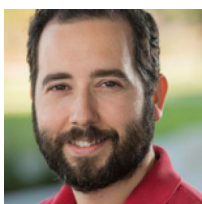


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Angel Yanguas-Gil

Principal Materials Scientist, Argonne National Laboratory

With a background in theoretical physics, Angel's current research activities focus on two areas: materials growth and neuromorphic computing.

In the area of materials, the focus of his research is understanding the fundamentals of materials growth, with a specific emphasis on the areas of advanced electronic materials and semiconductor processing. Angel's research leverages the advanced computing, X-ray characterization, and the cutting-edge materials synthesis capabilities at Argonne to understand the synthesis of nanomaterials using chemistry-based techniques such as atomic layer deposition. Active areas of research include wide bandgap semiconductors for advanced power electronics, the development of in-situ capabilities to probe the structure of nanomaterials, and the development of state of the art, multiscale simulation tools to predict the scale up of thin film growth and the dynamics of infiltration for high aspect area materials.

In the area of neuromorphic computing, the research focuses primarily on the exploration of novel architectures and algorithms to design smart systems and sensors inspired on the insect brain. Angel currently leads a project from Defense Advanced Research Projects Agency's Lifelong Learning Machines program focused on the development of systems capable of dynamic learning. In addition to the exploration of novel architectures and algorithms, the research also focuses on understanding how to best translate these architectures into hardware, both through the exploration of existing neuromorphic chips, and through the development of design principles that will help guide the design of novel materials and devices.



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Yuepeng Zhang

Material Scientist, Argonne National Laboratory
Moderator



Yuepeng Zhang is a Principal Materials Scientist at the Applied Materials Division and leads the effort on electrospinning and printed electronic devices.

Yuepeng has expertise in thin film and nanocomposite material synthesis by sputtering, electrospinning, and electrochemical deposition, as well as hybrid small-scale devices development. Her current research areas include novel nanofiber-membrane synthesis for solid-state battery, fuel cell, water splitting applications, component and device fabrication using printing and coating technologies, and machine learning assisted process scale-up and manufacturing.

Yuepeng currently serves as a principal investigator on the Defense Advanced Research Projects Agency's project on miniaturized non-reciprocal RF devices under the Magnetic Miniaturized and Monolithically Integrated Components program, as well as the DOE Advanced Manufacturing Office's Roll-to-Roll Advanced Manufacturing Consortium. Before joining Argonne, Yuepeng was a Principal Engineer at Western Digital Corporation conducting R&D on magnetic storage media used for heat-assisted magnetic recording.

Yuepeng has a Ph.D. and Masters in Materials Science & Engineering from McMaster University, Canada. After graduate school, she worked with Drs. Dominique Givord and Nora Dempsey as a post-doctoral researcher at Institut Neel — CNRS, Grenoble, France on 3D MEMS magnetic sensors and high energy-density permanent magnets used for electric vehicle motors.

