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The 10th Anniversary of LSA: Featured Issue on Advanced Liquid Crystal Photonics

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Submission deadline: 31st March, 2022

After nearly six decades of extensive material research and development, device innovation, and heavy investment on advanced manufacturing technologies, liquid crystal display (LCD) has become ubiquitous in our daily lives. Its applications span from smartphones, pads, notebook and desktop computers, TVs, and data projectors, to augmented reality and virtual reality, just to name a few. In addition to displays, liquid crystal is also a promising phase modulation material for manipulating light in multiple degrees of freedom and dimensions, from space domain (amplitude, phase, polarization, orbital angular momentum), frequency domain (UV, visible, infrared, microwave to terahertz), to time domain. By controlling the phase modulation profile along polar angle, new photonic devices such as spatial light modulators for beam shaping and adaptive focus, adaptive optics for beam steering and LiDAR, and various waveplates have been demonstrated. On the other hand, by generating the phase modulation along azimuthal angle, geometric phase optical elements with a highly polarization selectivity have found widespread applications in flat diffractive optics. In the meantime, by implementing functional groups or integrating special dopants into a mesogen, multi-responsive (thermal, photo, and biological) liquid crystals can be realized, which provides a soft-matter platform for assembling optical materials for photonics and integrated photonic devices, such as manipulators, actuators, lasers, and highly directional backlight systems. In addition, liquid crystals can be used as soft templates for directing self-assembly of functional nanoparticles and developing advanced chiral nanomaterials, which not only deepens the understanding on the fundamentals of soft matter chirality but also opens an avenue for transformative chiral photonics and chiral plasmonics that are associated with diverse applications, such as quantum communication, optical spintronics, optical information processing, and beyond.

This featured issue is launched to celebrate the 10th Anniversary of Light: Science & Applications. In this featured issue, we are soliciting original contributions with broad impact to advance the state-of-the-art of liquid crystal photonics, including but not limited to the following topics:

- Advanced liquid crystal display devices
- Novel liquid crystal devices for augmented reality and virtual reality
- New functional liquid crystal materials
- Liquid crystal-based chiral nanomaterials
- Stimuli-responsive liquid crystal devices
- Adaptive geometric phase optical elements
- Liquid crystal embedded meta-surfaces, meta-lens, meta-grating
- Nature-inspired liquid crystal molecular structures
- Liquid crystal microstructures for optics
- Liquid crystal nonlinear optics
- Topological photonics based on liquid crystals
- Liquid crystal enabled quantum optics
- Photonic devices based on alignment technology

Guest editors:



Shin-Tson Wu is a Pegasus professor at College of Optics and Photonics, University of Central Florida. Prior to joining UCF in 2001, he was with Hughes Research Laboratories where the first laser was invented. He received his Ph.D. in physics from University of Southern California. His research at UCF focuses on three areas: 1) Advanced displays, including mini-LED, micro-LED, quantum-dot LCD, and augmented reality and virtual reality displays, 2) Adaptive optics for laser beam steering and foveated imaging, and 3) Adaptive lens, such as tunable/switchable focus liquid crystal and liquid lenses. Prof. Wu is the recipient of OSA Esther Hoffman Beller medal (2014), SID Slottow-Owaki prize (2011), OSA Joseph Fraunhofer award (2010), SPIE G. G. Stokes award (2008), and SID Jan Rajchman prize (2008). In 2014, he was inducted to the inaugural Florida Inventors Hall of Fame. He is a Charter Fellow of the National Academy of Inventors, and a Fellow of the IEEE,

OSA, SID, and SPIE. Dr. Wu has co-authored 7 books, 640 journal papers, 300 conference papers, and obtained 192 patents including 93 U.S. patents. His publications have accumulated 40,000 citations with an h-index of 94. In the past, he served as founding Editor-In-Chief of the IEEE/OSA Journal of Display Technology, OSA Publications Council Chair, OSA Board of Directors, and SID honors and awards committee chair.



Quan Li is Distinguished Chair Professor and Director of Institute of Advanced Materials at Southeast University. He held appointments in USA, Germany, and France. Li received his Ph.D. in Organic Chemistry from the Chinese Academy of Sciences (CAS), where he was promoted to a youngest Full Professor of Organic Chemistry and Medicinal Chemistry in February 1998. He is a Fellow of the Royal Society of Chemistry (FRSC). He has been elected as a member of the European Academy of Sciences and a member of European Academy of Sciences and Arts. He has also been honored as Professor and Chair Professor at several universities. In the past ten years, he has edited eight books (2 Wiley-VCH, 2 Wiley, and 4 Springer books), and has co-authored 40 chapters including the invited author of the entry entitled “*Liquid Crystals*” in the prestigious Kirk-Othmer Encyclopedia. He has been listed among the world’s top 2% scientists by Stanford University. Li’s current research interest spans from stimuli-responsive smart soft matter, advanced photonics, and optoelectronic materials for energy harvesting and energy saving to functional biocompatible materials and nanoparticles to nanoengineering and device fabrication.



Yan-qing Lu received both his BS and Ph.D. degrees from Physics department, Nanjing University, China, in 1991 and 1996 respectively. Then he joined the department of materials sciences and engineering, Nanjing University as a lecture (1996) and associate professor (1998). He has worked in Academia and Industry in the United States from 2000 to 2006, where he developed a serial of liquid crystal based fiber-optic devices with his colleagues in Chorum Tech., CREOL, UCF and EZconn. Corp. He is currently a Changjiang distinguished professor at Nanjing University and a Fellow of OSA (Optical Society of America), Fellow of COS (Chinese Optical Society). He currently serves as the director of Chinese Liquid Crystal Society, the executive editor-in-chief for *Chinese Optics Letters* and the vice editor-in-chief for *Chinese Journal of Liquid Crystal and Display*. His research interests include liquid crystal photonics, fiber optics and nonlinear optics. He is the author or co-author of over 250 peer-reviewed papers in *Science*, *Sci. Adv.*, *Nature Comm.*, *PRL*, *Adv. Mater.*, *Light Sci. Appl.*, *Optica*, etc. with over 6000 citations. He also holds more than 50 domestic or international patents or pending patents.