

A special issue on *Information Optoelectronics: Devices, Technologies and Applications*

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Information technology has entered a big-data era. The every-increasing data traffic has driven the rapid development of information optoelectronics, which is related to key devices, crucial technologies, and important applications for the generation, transmission, processing, and detection of optical data information. Recent progresses on devices, technologies and applications of information optoelectronics have led to reduced footprint, improved efficiency, enhanced flexibility and extended functionality generating, delivering/manipulating, and detecting optical data information. Lots of integrated photonic devices, such as silicon-, graphene- and plasmon-assisted waveguides, lasers, modulators and detectors, speciality optical fiber, and coherent optical communications, have been widely reported, showing significant advances in devices, technologies and applications of information optoelectronics. It is believed that information optoelectronics will continue its rapid development towards integrated nanophotonic devices, more advanced technologies, flexible and multi-functional applications. It is our intention to draw great attention of the research community to those hot topics in devices, technologies and applications of information optoelectronics. In this “Special Issue on *Information Optoelectronics: Devices, Technologies and Applications*”, we present 8 review articles and 4 research articles focusing on relevant subjects by internationally active groups in the related fields.

In the review articles, Dr. Sudharsanan Srinivasan at University of California, Santa Barbara reviewed recent results on hybrid silicon mode-locked lasers focusing on low phase noise optical pulse generation. Key results included demonstration of the longest (cavity length 9 cm) integrated on-chip mode locked laser, 14 dB reduction of Lorentzian noise on a 20 GHz radio-frequency (RF) signal, and greater than 55 dB optical supermode noise suppression using harmonically mode locked long cavity laser, 10 GHz passively mode locked laser with 15 kHz linewidth using on-chip all optical feedback stabilization. Dr. Ran Hao at Zhejiang University reviewed recent developments of graphene-based optical modulators, including material property, different integration schemes, single-layer graphene-based modulator, multi-layer and few-layer graphene-based modulators, corresponding figure-of-merits, wavelength/temperature tolerance, and graphene-based fiber-optic modulator. Dr. Lai Wang at Tsinghua University reviewed recent progresses on InGaN quantum dot (QD) light emitting diodes (LEDs), including the basic physics model of the strain relaxation in self-assembled InGaN QDs, the growth of InGaN QDs with a growth interruption method by metal organic vapor phase epitaxy, the optimization of GaN barrier growth in multilayer InGaN QDs, and the green, yellow-green and red InGaN QD LEDs. Dr. Xiaowei Guan and Dr. Daoxin Dai at Zhejiang University reviewed progresses on various hybrid plasmonic waveguides as well as ultrasmall functionality devices. Ultra-sharp bending of silicon hybrid nanoplasmonic waveguides, optical couplers/splitters, ultrasmall resonators, and polarization handing devices were discussed. Dr. Jian Wang at Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology reviewed recent progress on plasmon-assisted nanophotonic devices and their wide applications, including long-range hybrid plasmonic slot (LRHPS) waveguide, ultra-compact plasmonic microresonator with efficient thermo-optic tuning, high quality (Q) factor and small mode volume, compact active hybrid plasmonic ring resonator for deep-subwavelength lasing

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applications, fabricated hybrid plasmonic waveguides for terabit-scale photonic interconnection, and metamaterials-based broadband and selective generation of orbital angular momentum (OAM) carrying vector beams. Dr. Qi Mo and Dr. Cheng Du at Fiberhome Telecommunication Technologies Co. Ltd reviewed developments of optical fiber, especially specialty optical fiber, such as bending insensitive single mode optical fiber, nanostructure modified optical fiber, rare earth doped fiber, and OAM transmission fiber. Dr. Changyuan Yu at National University of Singapore reviewed common phase error (CPE) and intercarrier interference (ICI) compensation methods for coherent optical orthogonal frequency division multiplexing (CO-OFDM) system. Dr. Ming Li at Institute of Semiconductors, Chinese Academy of Sciences reviewed recent progress on optical arbitrary waveform generation (AWG) techniques. The main enabling techniques for optically generating optical and microwave waveforms were introduced, including wavelength-to-time mapping, space-to-time mapping, temporal pulse shaping (TPS), optoelectronics oscillator (OEO), programmable optical filters, optical differentiator and integrator, and versatile electro-optic modulation implementations.

In the research articles, Dr. Charles Caer at University Paris-Sud investigated the slow light characteristics of silicon on insulator (SOI) slot photonic crystal waveguide (SPCW) and comb photonic crystal waveguide (CPCW), which were also fabricated and measured in integrated Mach-Zehnder interferometer (MZI). Dr. Dingbo Chen at University of California, San Diego presented modal analysis of the traditional high power waveguide integrated photodiode (WIP) design and pointed out the excitation of large Γ mode as the factor limiting the bandwidth-efficiency product at high power. Dr. Chuan Wang at Huazhong University of Science and Technology proposed a broadband filter using multi-layer sub-wavelength high-contrast grating (HCG) structure. A multilayer HCG broadband filter with a bandwidth of 843 nm and a center wavelength of 1550 nm was designed. Dr. Zhao Wu at Huazhong University of Science and Technology proposed and demonstrated an all-optical chromatic dispersion (CD) monitoring scheme utilizing the cross modulation effects of semiconductor optical amplifier (SOA) for 40 Gbit/s differential phase-shift keying (DPSK) system.

Overall, articles in this special issue introduce and discuss recent developments of information optoelectronics covering devices, technologies and applications. We hope the readers will find them interesting, helpful and inspiring.

Finally, we would like to sincerely appreciate all authors for their insightful review and research articles and all reviewers for their valuable comments and constructive suggestions.



Jian Wang (M'12) received the Ph.D. degree in physical electronics from the Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China, in 2008. He worked as a Postdoctoral Research Associate in the Department of Electrical Engineering, University of Southern California, Los Angeles, California, USA, from 2009 to 2011. He is currently a professor at the Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan, China. He is the Assistant Director of Wuhan National Laboratory for Optoelectronics. He is also a Chutian Scholar Distinguished Professor in Hubei Province. He gained supports from the New Century Excellent Talents in University in 2011 and China National Funds for Excellent Young Scientists in 2012.

Jian Wang is the member of IEEE, OSA, SPIE and COS. He has more than 150 publications including 2 book chapters, 1 special issue, 2 review articles, 29 invited talks/papers, 6 postdeadline papers, and more than 70 journal papers published on *Science*, *Nature Photonics*, *Scientific Reports*, *Applied Physics Letters*, *Optics Express*, *Optics Letters*, etc. He is a frequent reviewer of *Scientific Reports*, *Optics Express*, *Optics Letters*, etc. He has devoted his research efforts to photonic integrated devices and high-speed optical communications and optical data processing.