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COVER PICTURE

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Elucidating the Impact of Bi³⁺ Lone Pair on the Optical and Electronic Properties of Phosphonium-Based Halide Semiconductors (Advanced Optical Materials 36(2026))

All Amry, Anand P. Tiwari, Ananika Mishra, Andrea Woods, Kamal E. S. Nassar, Ioannis N. Gkikas, Amanda R. Sharrer, Ioannis Spanopoulos

e71679 | First Published: 25 September 2026

This article relates to: [▼](#)

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Water Stability and PFAS Sensing

The cover showcases the wearable, portable electrochemical sensor for detecting forever chemicals, such as PFAS and PCBs, in tap water samples. The sensor comprises the new water-stable phosphonium-based Bi(III) metal halide semiconductors with prominent optical and electronic properties, rendering them suitable for a series of portable optoelectronic applications. More details can be found in the Research Article by Ioannis Spanopoulos and co-workers (DOI: 10.1002/adom.71536).

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CORRECTION

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Correction to "Quasi-2D CsPbBr₃→ Composite Thin Films for Efficient and Stable Red Perovskite Light-Emitting Diodes"

e71733 | First Published: 07 September 2026

This article corrects the following: [▼](#)

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RESEARCH ARTICLE

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Elucidating the Impact of Bi³⁺ Lone Pair on the Optical and Electronic Properties of Phosphonium-Based Halide Semiconductors

All Amry, Anand P. Tiwari, Ananika Mishra, Andrea Woods, Kamal E. S. Nassar, Ioannis N. Gkikas, Amanda R. Sharrer, Ioannis Spanopoulos

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ADVANCED OPTICAL MATERIALS

Water Stability and PFAS Sensing

The cover showcases the wearable, portable electrochemical sensor for detecting forever chemicals, such as PFAS and PCBs, in tap water samples. The sensor comprises the new water-stable phosphonium-based Bi(III) metal halide semiconductors with prominent optical and electronic properties, rendering them suitable for a series of portable optoelectronic applications. More details can be found in the Research Article by Ioannis Spanopoulos and co-workers (DOI: 10.1002/adom.71536).

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Triplet State Engineering in Regioisomeric Cocrystals Enabling Dual Phosphorescence and Efficient Thermally Activated Delayed Fluorescence

Sandhya Rani Nayak, Madhusudan Dutta, Vishnu Mishra, Rishukumar Panday, Partha Hazra

e71698 | First Published: 31 August 2026

The triplet states of the regioisomeric cocrystals are engineered by selecting an appropriate acceptor, enabling a tunable singlet-triplet energy gap and hence excited-state lifetime. Strong vibronic coupling between local and charge transfer triplets, combined with a small singlet-triplet gap, allows a fast RISC rate. All the cocrystals exhibit distinct dual phosphorescence from local and charge transfer triplet states at cryogenic temperatures.

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Ultra-Dark on-Chip Plasmonic Lattice Lasers for High-Density Integrations

Menghan Li, Huafeng Ding, Ran Chen, Jianing Chen, Jianjun Chen

e71729 | First Published: 17 September 2026

By fabricating high-quality Ag-SiO₂ nanodisk lattices with improved methods, "ultra-dark" plasmonic lattice lasers with ultra-high Q are realized. The ratio of laser emission in free space is only ~1%. Linewidths of as small as Δλ_{FWHM} ≈ 0.033 nm at visible wavelengths are obtained at room temperature, and the corresponding Q factor is as high as Q ≈ 2.1 × 10⁵.

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Seamless Integration of Unidirectional Nanowires With ITO Enables High-Performance Transparent Synapse Arrays Via Interfacial Ion-Electronic Coupling

Yao Wang, Jinshao Liu, Da Li, Shubin Yi, Meng Pang, Guofu Zhou, Wanglong Mao, Jinyou Xu

e71735 | First Published: 27 August 2026

A transparent high-performance UV-responsive optoelectronic synapse is demonstrated by seamless integration of unidirectional nanowires with transparent electrodes. The synergistic effect of the ion-electron coupling at Cs-8TBT/ITO interface and the oriented nanowire architecture transforms transient photoresponse, consequently yields two-orders-of-magnitude prolonged persistent photoconductivity, two-fold enhanced paired-pulse facilitation, linear <500 conductance updates, and multifunctional neuromorphic applications including long-term pattern recognition and arithmetic computing.

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Thin Phosphorus-Oxide-Assisted Electrically Pumped Mid-Infrared Light Emission in a Twisted Black Phosphorus Structure with Polarization Switching

Bolin Gong, Meng Ge, Yan Luo, Xiangxi Zhu, Chao Zhu, Gang Ouyang, Xiaolong Chen

e71736 | First Published: 05 September 2026

Nanometer-scale P₂O₅ is naturally formed as an interfacial layer between twisted BP structures through oxidizing in ambient conditions. Direct tunneling and F-N tunneling occur for carriers when they transport through the P₂O₅ layer. The low valence band maximum of P₂O₅ serves as an effective hole-blocking layer, achieving electrically pumped polarization-tunable mid-infrared emission.

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Off-Resonant Chiroptical Enhancement for Enantiomeric Discrimination Through Weak Measurement

Tianshi Lu, Sze Hian Tan, Yufeng Wei, Kaichen Dong, Mengzhe Shen, Xinghui Li, Dapeng Wang

e71737 | First Published: 31 August 2026

The intrinsic homochirality of lifetimes underscores the importance of real-time and accurate enantiomers discrimination techniques in various fields. The integrable subwavelength gratings system leverages the principle of weak measurement to amplify the circular dichroism (CD) signals. The strategy offers a promising route for detecting chiral molecules with UV or near-infrared resonances using a visible-light chiroptical platform.

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Ultrasensitive Terahertz Spintronic Modulator for On-Chip Applications

Avinash Chaurasaya, Ziqi Li, Yingshu Yang, S. N. Piramanayagam, Marco Battiato, Elbert E. M. Chia, Rajdeep Singh Rawat

e71738 | First Published: 05 September 2026

Uniaxial magnetic anisotropy in a single-layer CoFeTaZr spintronic emitter enables ultrasensitive control of broadband terahertz spin current pulses using magnetic fields weaker than 1 Oe – orders of magnitude below conventional requirements. Sharp 180° polarization switching, governed by the angle between the magnetization and applied field, offers a promising route toward field-programmable on-chip terahertz devices.

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Near-Field Nanomaging of Programmable Phase Transitions in Ga⁺-Irradiated VO₂

Sarabpreet Singh, Nareg Ghazikhanian, Muhammad Asjad, Erbin Qiu, Ivan K. Schuller, Yohannes Abate

e71741 | First Published: 05 September 2026

Focused Ga⁺ ion irradiation locally reprograms the insulator-to-metal transition in VO₂ thin films. Infrared and terahertz near-field nanomaging reveals that low irradiation doses localize the resistive-switching filament within the defect region, while high doses suppress switching there and redirect the filament into pristine VO₂. This dose-tunable defect engineering offers a scalable route to energy-efficient, programmable neuromorphic devices.

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Helium Ion-Induced Degradation Mechanisms in Optical Coatings for Space Applications

Alain J. Corso, Marta Padovani, René Hübner, Ulrich Kentsch, Andrea Meneguzzo, Maria G. Pelizzo

e71743 | First Published: 10 September 2026

Although low-energy helium ions represent a significant source of degradation for optical coatings operating in space environments, their effects remain poorly understood. Systematic irradiation of over 150 metal and dielectric, thin-film samples at 4, 16, and 100 keV investigates the damage mechanisms and their impact on optical performance, establishing empirical reference fluences to guide coating testing for future space missions.

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Enhanced Performance and Stability of Paper-Based Cs₃Cu₂I₃ Photodetectors via PVK In Situ Encapsulation

Zongxuan Liu, Ying-Li Ma, Jin-Cheng Lei, Chen-Yang Zhang, Rui Wei, Yuqing Wang, Yang Wang, Yining Meng, Xin Wang, Shun-Xin Li

e71744 | First Published: 05 September 2026

A stable Cs₃Cu₂I₃/PVK type-II heterojunction is developed for paper-based photodetectors via in situ encapsulation. The PVK layer optimizes the interface morphology and protects the perovskite from environmental degradation. The resulting devices exhibit exceptional flexibility and enhanced optoelectronic performance, offering an eco-friendly solution for next-generation portable detection technologies.

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An Ultra-Compact Broadband Metaleins-Based Structured Light Analyzer

Junjie Zou, Zihan Mei, Deqian Zheng, Yuhui Hu, Tianzhang Peng, Ming Zhao, Cheng Zhang, Zhenyu Yang

e71745 | First Published: 11 September 2026

An ultra-compact broadband structured light analyzer driven by a neural network-optimized metasurface is presented. Overcoming the limitations of conventional bulky optics, this compact device achieves high-precision, real-time decoupling of full Stokes parameters and wavefront phase gradients across the visible spectrum. It accurately characterizes complex vector light fields, providing a powerful paradigm for minimization and multifunctional optical integration and adaptive optics.

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Epitaxially Grown Li⁺-Conductive Li_{0.33}La_{0.556}TiO₂Yb³⁺/Er³⁺ Thin Film Enabling Ion-Migration-Driven Modulation of Upconversion Luminescence for Potential Electro-Optical Memory Emitter

Yinghan Wang, Haisheng Chen, Yu An, Zitao Chen, Yifei Zhao, Gongxun Bai, Yang Zhang, Jianhua Hao, Shi Ye

e71749 | First Published: 10 September 2026

By applying an external electric field to drive the directional migration of Li⁺ ions within the ion-conductive thin film (Li_{0.33}La_{0.556}TiO₂Yb³⁺/Er³⁺), the local chemical environment surrounding Er³⁺ ions is reversibly perturbed, enabling dynamic and reversible modulation of upconversion luminescence. This device demonstrates a temporal memory behavior and holds promise for application in electro-optical memory emitter.

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Suppressing Ion Migration in Metal Halide Perovskite via High-Valent Rare-Earth Ions Doping Induced Phase Pinning

Junyu He, Weihao Zheng, Jun Luo, Wanru Kong, Yang Li, Tongqing Sun, Anshi Chu, Min Li, Xujian Zhuang, Shulin Chen

e71750 | First Published: 12 September 2026

Ion migration in mixed halide perovskites represents a critical challenge that undermines the optical stability and device performance of perovskite-based optoelectronics. Here, we demonstrate a strategy to stabilize the heterojunction structure via erbium (Er)-doping induced phase pinning, which fundamentally modulates the phase behavior of the alloyed perovskite system. In the pristine homogeneous alloying state, light-soaking triggers reversible ion migration, driving the formation of a transient heterojunction that readily recovers upon light removal. In contrast, Er-doping locks the system into an intrinsic heterojunction configuration, inhibiting light-induced ion migration while promoting defect passivation under illumination. This results in an optically stable heterojunction with suppressed phase segregation and enhanced photostability. Our findings establish a materials design principle to mitigate ion migration and stabilize heterojunctions in halide perovskites, paving the way for robust, long-lived optoelectronic devices.

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Single-Shot Measurement of Optical Polarization State with Metasurface

Kun Zhao, Yonghua Lu, Qiang Fu, Zhengting Du

e71751 | First Published: 09 September 2026

This study presents a titanium dioxide (TiO₂) metasurface consisting of tetratomic macropixels for single-shot optical polarization state detection, which extracts the chiral amplitude ratio and chiral phase difference from spatially separated focal spots and central interference pattern to determine the polarization state of incident light. Average relative error down to 5.33% is demonstrated experimentally for the full-Stokes parameters of the light.

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ZnS Nanocrystal-Mediated Spacing and Band Engineering for Efficient and Stable Blue ZnSeTe QLEDs

Jixing Chen, Quyan Li, Jinhui Jiang, Yusheng Song, Yi Liang, Tianfeng Zhang, Xuetong Wu, Huahao Wu, Bingsuo Zou, Sheng Cao, Jialong Zhao

e71752 | First Published: 05 September 2026

A ZnS nanocrystal-mediated strategy is introduced to regulate exciton energy transfer and carrier injection in blue ZnSeTe quantum dot light-emitting diodes. The incorporation of ZnS nanocrystals increases the inter-dot distance, suppresses Förster resonance energy transfer, and enhances radiative recombination. Consequently, the optimized devices achieve a peak external quantum efficiency of 21.2% and a T₅₀ lifetime of 220.2 h at 100 cd m⁻².

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Facile, Scalable, and High-Yield Synthesis of a Near-Unity Quantum Yield Zero-Dimensional Copper Halide Cs₂Cu₂Cl₅ Scintillator for X-Ray Imaging

Yoon Seung Choi, Jaeyoung Im, Hyunjun Kim, Chaeyoung Kim, Min Kyu Kim, Kang Heo, Dooho Kim, Sanghoom Kim, Hyunmin Yang, Jinu Lee, Sung Oh Cho, Bo Kyung Cha, Byungha Shin

e71753 | First Published: 08 September 2026

A dioxolane-mediated reaction synthesis provides a simple and scalable route to phase-pure Cs₂Cu₂Cl₅ scintillator powders with near-complete conversion, near-unity photoluminescence quantum yield, and long-term stability. The resulting green-emitting composite films exhibit strong radioluminescence, high light yield, and practical compatibility with flat-panel X-ray imaging and computed tomography for next-generation lead-free scintillator systems.

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