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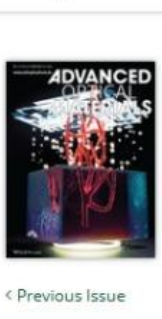

Advanced Optical Materials: Volume 13, Issue 27

September 23, 2025

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Cover Picture

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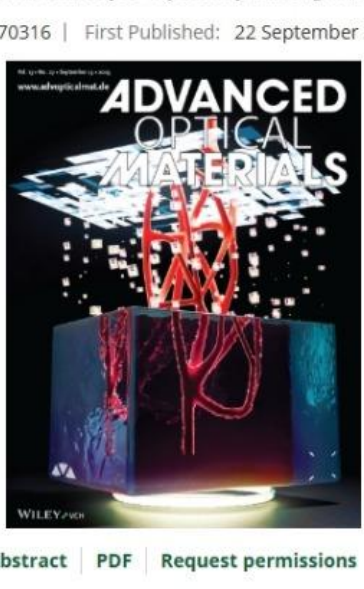
VITRO-P: Revolutionizing Optical Tissue Phantoms with Tailored Vascular Structures (Advanced Optical Materials 27/2025)

Arnab Chatterjee, Piyush Raj, Lintong Wu, Swati Tanwar, Ishan Barman

e70316 | First Published: 22 September 2025



Generative Vasculature
The cover art is an artistic representation of the VITRO phantom being generated in real-time using the generative design algorithm. The blue pixelated grid represents the algorithm, the cubes represents the building blocks and the semi completed phantom with vasculature can be seen at the bottom. More details can be found in the Research Article by Ishan Barman and co-workers (10.1002/adom.202500800).

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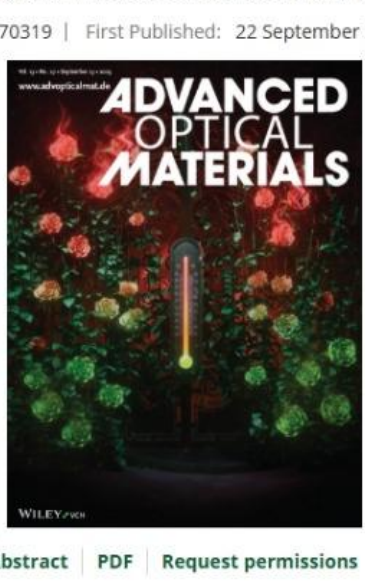
Inside Front Cover

Free Access

Thermal-Energy-Boosted Luminescence for Precise Optical Thermometry in Eu/Tb-Doped $ScNbO_4$ (Advanced Optical Materials 27/2025)

Sangwon Wi, Chaeyeon Lee, Jaeho Han, Yunsang Lee

e70319 | First Published: 22 September 2025



High-Contrast Color-Changing Optical-Thermometry
In the Research Article, Sangwon Wi, Yunsang Lee, and co-workers introduce a novel optical thermometry method leveraging thermally-boosted luminescence in Eu/Tb-doped $ScNbO_4$. Exploiting contrasting temperature-dependent behaviors—Eu^{3+} luminescence increases while Tb^{3+} decreases with temperature—this approach achieves outstanding sensitivity (5.48% K^{-1}), distinct spectral discrimination, and spatial resolution, paving the way for precise, stable, and versatile thermal sensing applications. (Doi: 10.1002/adom.202500863).

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Inside Back Cover

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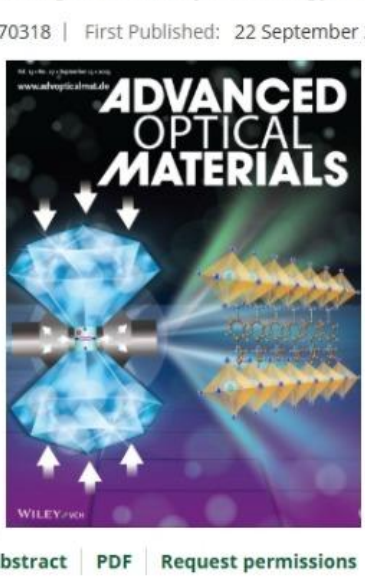
Pressure-Induced Structural and Optoelectronic Modulations in 2D Dion-Jacobson Hybrid Lead Iodide Perovskites With a Rigid Spacer (Advanced Optical Materials 27/2025)

Aditya Kutty, Jesse Ratté, Rongfeng Guan, Jingyan Liu, Sean Tao, Yanqian Lin, Matthew P. Hautzinger, Willa Mihalyi-Koch, Song Jin, Yang Song

e70318 | First Published: 22 September 2025



2D Hybrid Organic-Inorganic Perovskites
Pressure-induced structural distortion of a 2D Dion-Jacobson type hybrid organic-inorganic perovskite revealed unusual compressibility behavior associated with spacer rigidity, highly correlating with the optoelectronic properties including bandgap energy and photoluminescence quantum yield modulation. More details can be found in the Research Article by Yang Song and co-workers (Doi: 10.1002/adom.202500602).

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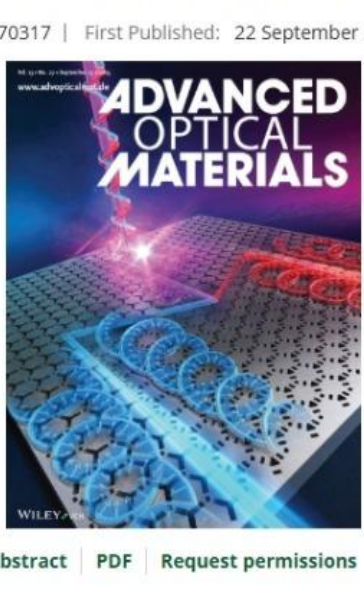
Inverse Design of Dual-Band Valley-Hall Topological Photonic Crystals With Arbitrary Pseudospin States (Advanced Optical Materials 27/2025)

Yuki Sato, Shrinathan Esaki Muthu Pandara Kone, Junpei Oba, Kenichi Yatsugi

e70317 | First Published: 22 September 2025



Inverse-Designed Valley Photonic Waveguides
An inverse design strategy for valley photonic crystals with desired pseudospin states is introduced using transverse spin angular momentum as a design metric. The method automatically tailors pseudospin-dependent band-edge states to realize dual-band waveguides that route light along distinct topological channels depending on frequency, delivering robust, backscattering-immune performance without iterative trial-and-error processes. More details can be found in the Research Article by Yuki Sato, Kenichi Yatsugi, and co-workers (DOI: 101002/adom.202500994).

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Issue Information

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Issue Information

e70320 | First Published: 22 September 2025

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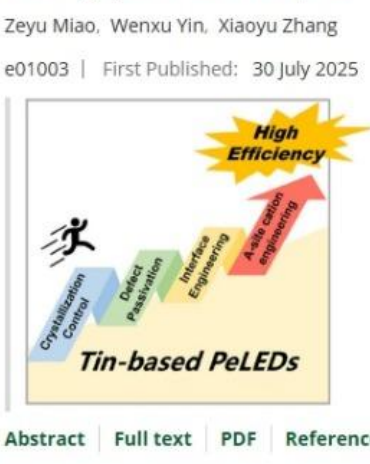
Review

Full Access

Advancing Tin-Based Perovskite Emitters for High-Performance Displays: Strategies, Challenges, and Future Prospects

Zeyu Miao, Wenxu Yin, Xiaoyu Zhang

e01003 | First Published: 30 July 2025



This review highlights recent progress in tin-based PeLEDs for eco-friendly, high-performance, and high-definition full-color displays. Emphasis is placed on strategies to achieve efficient red, blue, and particularly challenging green emissions through compositional engineering, additive optimization, and structural tailoring, paving the way for full-color, lead-free PeLED technologies compliant with Rec.2020 standards.

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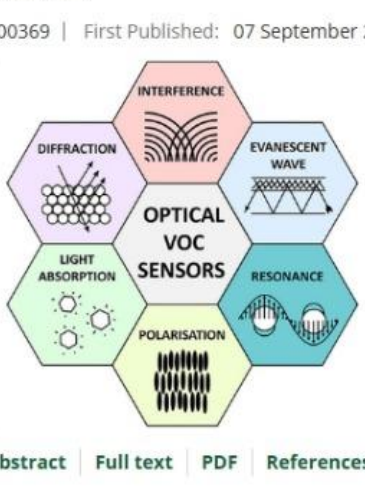
Optical Detection of Volatile Organic Compounds: A Review of Methods and Functionalized Sensing Materials

Aleksandra Hernik, Jorid Smets, Zhe Wang, Yuliya Semenova, Jin-Chong Tan, Rob Ameloot, Izabela Naydenova

e00369 | First Published: 07 September 2025



The focus on volatile organic compounds (VOCs) detection is dictated by the increasing awareness of their impact on human health. In addition, VOCs are increasingly considered novel for early diagnosis of diseases. Among various types of VOC sensor devices, optical detectors play an essential role, offering excellent versatility, fast response time, and suitability for remote detection.

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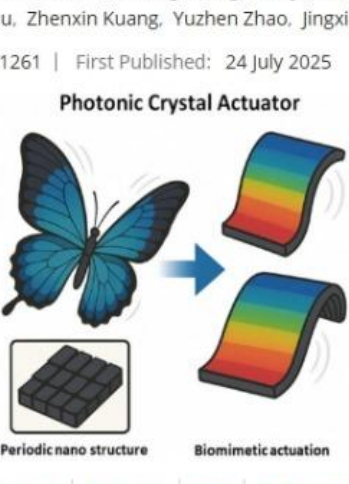
Bio-Inspired Photonic Crystal Actuator

Junchao Liu, Chenfang Zhang, Pan Jia, Zhong Yu, Xiaojiao Yu, Jinfen Niu, Ningning Zhao, Rongwei Kou, Zhenxin Kuang, Yuzhen Zhao, Jingxia Wang

e01261 | First Published: 24 July 2025



This review highlights recent advances in bio-inspired photonic crystal actuators, focusing on fabrication strategies, stimulus-responsive mechanisms, and multifunctional applications. Emphasizing polymer, hydrogel, and liquid crystal systems, it explores structural color modulation and mechanical actuation, offering insights into intelligent soft materials for sensing, robotics, energy conversion, and biomedical devices.

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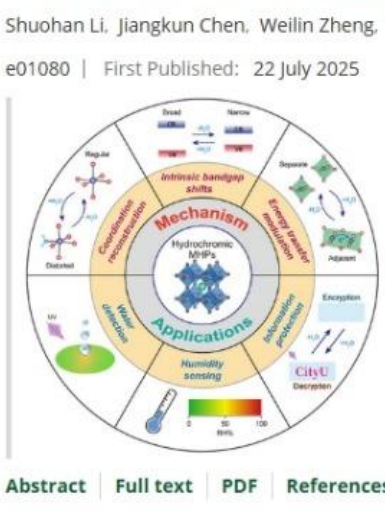
Emerging Hydrochromic Metal Halide Perovskites

Shuohan Li, Jiangkun Chen, Weilin Zheng, Yang Guo, Siyuan Wang, Feng Wang

e01080 | First Published: 22 July 2025



Hydrochromic metal halide perovskites (MHPs) are promising candidates for next-generation smart optical materials owing to their excellent responsiveness, superior reversibility, and highly tunable emission. This review summarizes the latest progress in hydrochromic MHPs and provides general principles for the rational design of advanced hydrochromic MHPs by elucidating the mechanisms underlying the structure-property correlation.

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Research Article

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VITRO-P: Revolutionizing Optical Tissue Phantoms with Tailored Vascular Structures

Arnab Chatterjee, Piyush Raj, Lintong Wu, Swati Tanwar, Ishan Barman

2500800 | First Published: 27 May 2025

VITRO-P
Vascular Integrated Tissue Replica Optical - Phantom

Advancements in spectroscopy lack standardized testing tools, limiting progress. Current tissue phantoms often omit vasculature, reducing realism. VITRO-P: a customizable optical phantom using generative design and 3D-printed molds is introduced to replicate vascular networks. Supporting sustained fluid flow and customizable vascular networks, VITRO-P offers a versatile, biomimetic platform that enhances biomedical research and clinical optical device validation.

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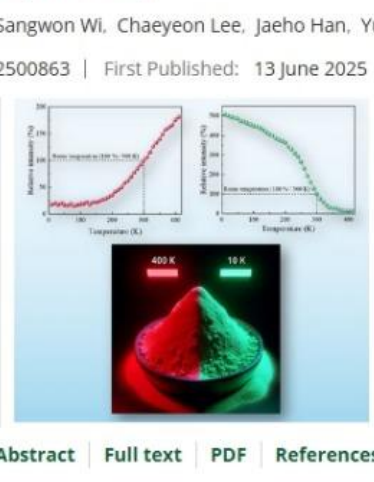
Thermal-Energy-Boosted Luminescence for Precise Optical Thermometry in Eu/Tb-Doped $ScNbO_4$

Sangwon Wi, Chaeyeon Lee, Jaeho Han, Yunsang Lee

2500863 | First Published: 13 June 2025



This paper presents a novel phosphor for high-performance optical thermometry utilizing thermal-energy-assisted luminescence boosting. The samples are prepared by incorporating Eu-doped $ScNbO_4$ and Tb-doped $ScNbO_4$ powders into a PDMS matrix. Under blue light excitation, the sample exhibits a stunning emission color change from green to red as the temperature increased. Based on this unique behavior, precise optical thermometry is performed.

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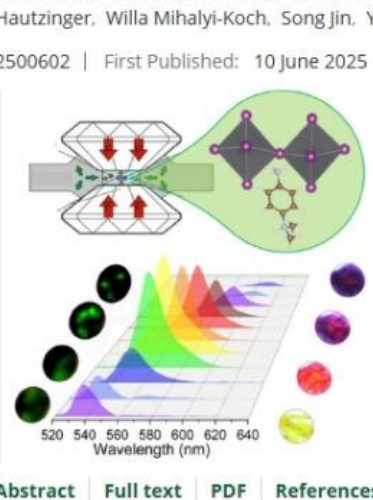
Pressure-Induced Structural and Optoelectronic Modulations in 2D Dion-Jacobson Hybrid Lead Iodide Perovskites With a Rigid Spacer

Aditya Kutty, Jesse Ratté, Rongfeng Guan, Jingyan Liu, Sean Tao, Yanqian Lin, Matthew P. Hautzinger, Willa Mihalyi-Koch, Song Jin, Yang Song

2500602 | First Published: 10 June 2025



Compression to ≈2.0 GPa results in a non-monotonic enhancement of the Pb-I bond distortion, rarely observed in other 2D lead-iodide hybrid perovskites. The octahedral distortion together with the rigidity of spacer cation are found to play a dominant role in determining the optoelectronic properties of $DPDAPbI_4$ under high pressure.

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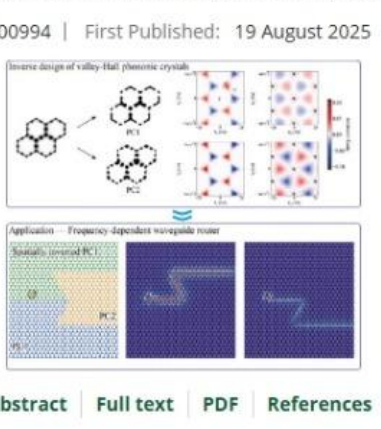
Inverse Design of Dual-Band Valley-Hall Topological Photonic Crystals With Arbitrary Pseudospin States

Yuki Sato, Shrinathan Esaki Muthu Pandara Kone, Junpei Oba, Kenichi Yatsugi

e00994 | First Published: 19 August 2025



This study presents an inverse design framework of valley photonic crystals with arbitrary pseudospin states. An inverse design problem is formulated using transverse spin angular momentum at the band edge for engineering the desired topological properties. Numerical experiments demonstrate that a photonic crystal waveguide designed by the proposed method exhibits dual-band operation, enabling frequency-dependent robust light routing.

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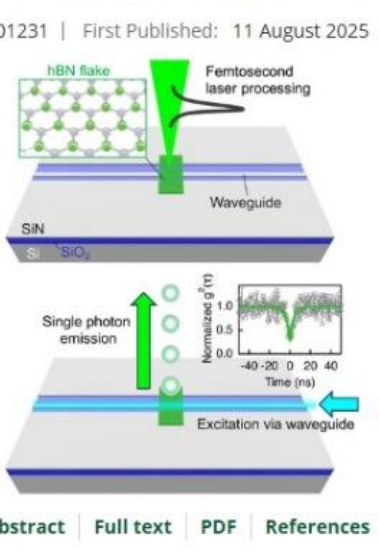
Spatially Deterministic Integration of hBN Single-Photon Emitters on SiN Waveguides Via Femtosecond Laser Processing

Daiki Yamashita, Masaki Yumoto, Aiko Narazaki, Makoto Okano

e01231 | First Published: 11 August 2025



Femtosecond-laser writing enables spatially deterministic integration of room-temperature single-photon emitters in hexagonal boron nitride onto pre-fabricated silicon nitride waveguides. Confocal photoluminescence microscopy characterizes laser-written defects, one of which exhibits narrow-linewidth emission, pronounced polarization dependence, high brightness, and stable single-photon emission. On-chip excitation via the silicon nitride waveguide preserves photon purity, demonstrating compatibility with mature photonic platforms. This scalable integration technique paves the way for hybrid quantum photonic circuits with 2D materials.

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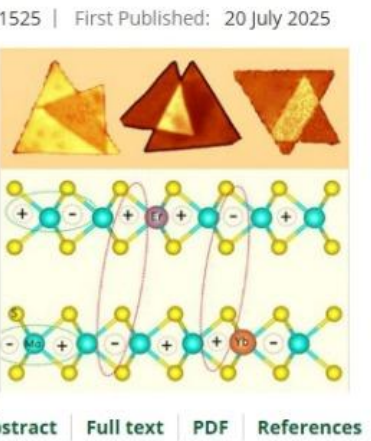
Tunable Interlayer Excitons and Photoluminescence in Rare-Earth Dual-Doped MoS_2 Homojunctions via Twist-Angle-Engineered Nanoarchitectonics

Mingzhu Hou, Huan Wang, Hui Yang, Hangxin Bai, Min Xiao, Hailong Qiu, Fangli Jing, Zhanggui Hu, Yicheng Wu, Hongjun Liu

e01525 | First Published: 20 July 2025



Rare-earth Er-MoS_2/Yb-MoS_2 dual-doped homojunction with specific twist angles is reported for the first time and exhibits a threefold PL intensity enhancement with a prolonged exciton lifetime relative to the single doped MoS_2. This unique behavior arises from the formation of localized interlayer excitons induced by two synergistic factors: rare-earth doping modulating effect and specific stacking geometry optimizing interlayer coupling.

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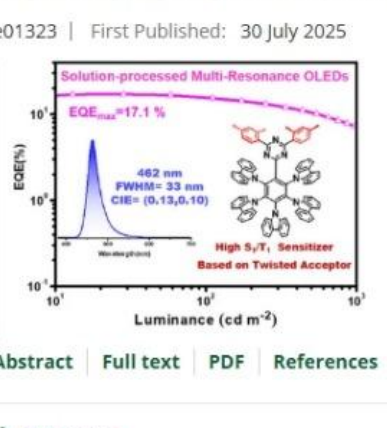
High-Energy-Level TADF Sensitizers Based on Twisted Diphenyltriazine Acceptors for Deep-Blue Multi-Resonance OLEDs

Song Shi, Xingdong Wang, Lei Zhao, Jianhong Lv, Shiyang Shao, Lixiang Wang

e01323 | First Published: 30 July 2025



Two high-energy-level thermally activated delayed fluorescence sensitizers are developed by using twisted diphenyltriazine as acceptors, which simultaneously achieve high singlet/triplet energy levels of ≈2.97/2.89 eV and a fast reverse intersystem crossing rate of ≈5.02×10^6 s^{-1} for efficient deep-blue multi-resonance organic light-emitting diodes.

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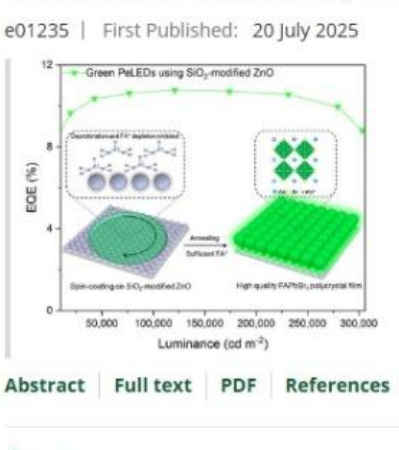
Ultra-Bright Green Perovskite Light-Emitting Diodes Enabled by Silicon Oxide-Modified Zinc Oxide Electron Transport Layer

Jing-Ming Hao, Zhen-Yu Ma, Yong-Hui Song, Ya-Lan Hu, Guan-Jie Ding, Sami Ur Rahman, Yi-Chen Yin, Bai-Sheng Zhu, Cheng-Ming Wang, Zhi Zhao, Min Ge, Hong-Bin Yao

e01235 | First Published: 20 July 2025



Ultrabright green perovskite light-emitting diodes achieved via SiO_2-modified ZnO electron transport layer. By suppressing deprotonation at $FAPbBr_3$/ZnO interface, SiO_2 modified ZnO enables sufficient formamidinium (FA^+) retention, yielding high-quality $FAPbBr_3$ film with 10.8% external quantum efficiency (EQE) and maximum luminance exceeding 300,000 cd m^{-2}, maintaining 10% EQE with the luminance exceeding 120,000 cd m^{-2}.

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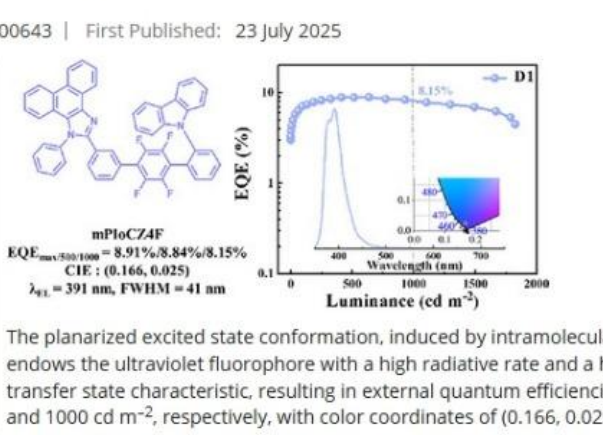
High Efficiency and Low Roll-Off Ultraviolet OLEDs Utilizing Robust Hybridized Local and Charge-Transfer Materials with Planarizing Excited State Geometry

Shengnan Wang, Shuyao He, Hao Huang, Runjie Ding, Lifen Xia, Yuchao Liu, Shian Ying, Dongge Ma, Shouke Yan

e00643 | First Published: 23 July 2025



The planarized excited state conformation, induced by intramolecular non-covalent interactions, endows the ultraviolet fluorophore with a high radiative rate and a hybridized local and charge-transfer state characteristic, resulting in external quantum efficiencies of 8.84% and 8.15% at 500 and 1000 cd m^{-2}, respectively, with color coordinates of (0.166, 0.025) in the device.

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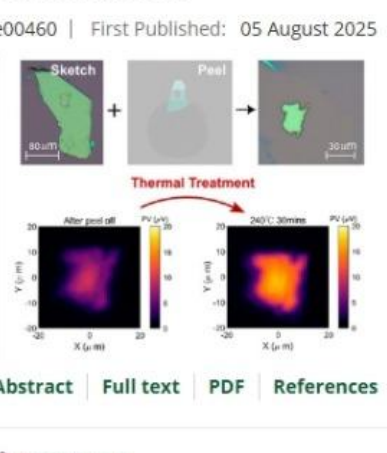
Sketch and Peel Focused Ion Beam Patterning of Black Phosphorus for Mid-Infrared Photonics

Huan Liu, Anders Barlow, Alexander Corletto, Christopher R. Hall, James Bullock, Shi Tang, Sivacarendran Balendhran, Seyed Saleh Mousavi Khaleghi, Sergey Rubanov, Trevor A. Smith, Yaping Dan, Kenneth Crozier

e00460 | First Published: 05 August 2025



"Sketch and peel" method nano-fabricates black phosphorus (BP) with minimal damage. A focused-neon ion beam "sketches" the pattern, followed by polyvinyl acetate-based "peeling" to remove surrounding flakes. Thermal treatment preserves the mid-infrared (MIR) emission of the isolated "Koala" structure, proving it as an enabling technology for future BP-based MIR nanophotonic devices.

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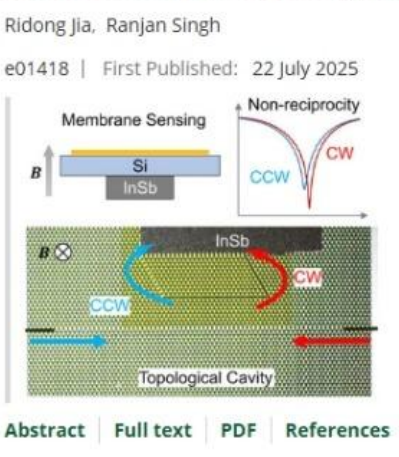
Non-Reciprocal Terahertz Topological Sensor on a Silicon Chip

Ridong Jia, Ranjan Singh

e01418 | First Published: 22 July 2025



A non-reciprocal terahertz topological sensor (NTTS) is experimentally demonstrated on a silicon valley photonic crystal chip by detecting the thickness and position changes of a polyimide membrane. The sensor exploits detuning between clockwise and counterclockwise topological cavity modes, induced by integrated magneto-optical InSb, to achieve non-reciprocal group delay sensitivities, aiming at chiral molecular sensing, on-chip gyroscopes, and environmental monitoring.

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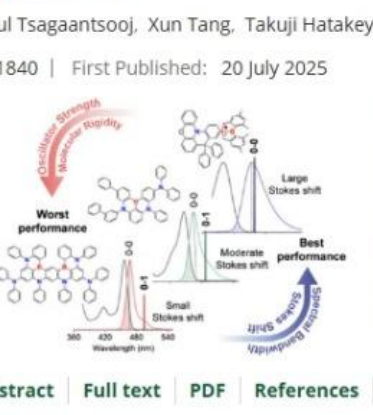
Role of Vibronic Structure and Spectral Separation in TADF Emitters for Efficient Organic Lasers

Tuul Tsagaantsooj, Xun Tang, Takuji Hatakeyama, Chihaya Adachi

e01840 | First Published: 20 July 2025



Efficient light amplification depends on balancing oscillator strength, spectral overlap, and vibronic emission. While rigid multi-resonance materials boost oscillator strength, their small Stokes shifts induce self-absorption. Enhancing the vibronic sideband can offset this by aiding light amplification. Conversely, large Stokes shifts (e.g., D–A systems like PXZN-B) minimize reabsorption, enabling robust amplification despite their moderate oscillator strength.

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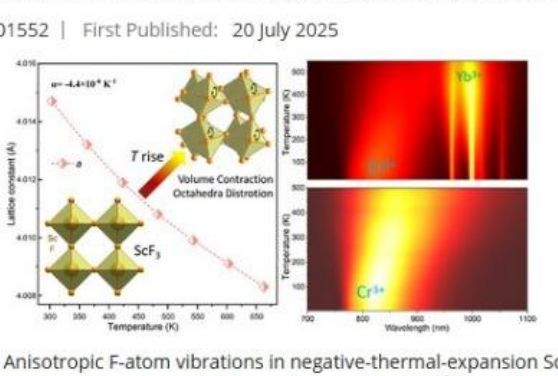
High-Temperature Negative-Thermal-Quenching in Broadband NIR Light-Emitting ScF_3:Cr^{3+} Phosphors

Yongjie Wang, Yingju Yan, Dongshuo Li, Qingzhou Bu, Guotao Xiang, Li Li, Sha Jiang, Xianju Zhou, Qilong Gao, Yaroslav Zhydachevskyy, Mikhail G. Brik, Andrzej Suchocki

e01552 | First Published: 20 July 2025



Anisotropic F-atom vibrations in negative-thermal-expansion ScF_3 drive octahedral distortion engineering, overcoming thermal quenching of Cr^{3+} broadband NIR emission and enabling high-temperature negative thermal quenching.

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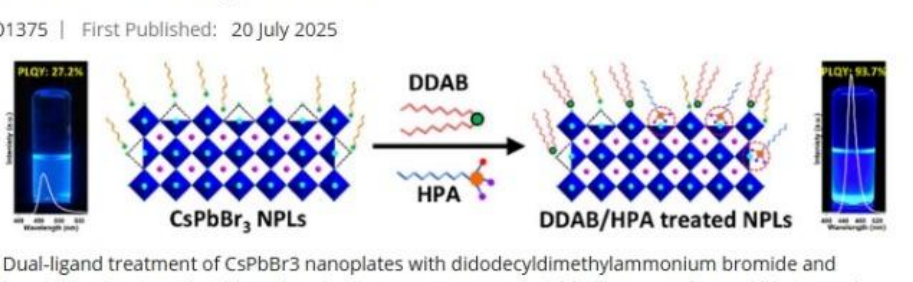
Defect Passivation via Dual-Ligand Surface Modification for Bright and Stable Blue Emission in $CsPbBr_3$ Nanoplatelets

Naresh Varnakavi, John Leo Velpugonda, Abhinav Kala, Matthew Yerich, Dylan Jones, Zhaohui Xing, Nithish Sharvirala, Arka Majumdar, Lih Y Lin

e01375 | First Published: 20 July 2025



Dual-ligand treatment of CsPbBr3 nanoplates with didodecyldimethylammonium bromide and hexylphosphonic acid yields a photoluminescence quantum yield of 93.7%. Enhanced lifetimes, slow-recovery kinetics, and improved thermal, ultraviolet, and moisture stabilities reflect suppressed non-radiative decay via defect passivation. This synergistic approach merges vacancy filling and surface binding to enable robust, high-efficiency quantum-confined emitters.

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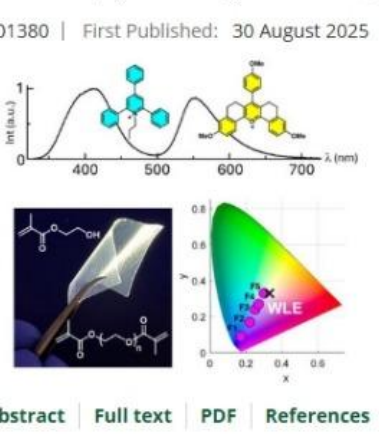
Organic, Transparent, and Flexible Films Exhibiting White-Light Emission via Polymer-Network Engineering: A Non-Dye-Centric Strategy

Jean C. Neto, Ayman Larek, Juan F. Miravet, Minoru Yamaji, Francisco Galindo

e01380 | First Published: 30 August 2025



A hydrogel-based white light-emitting (WLE) material is synthesized, where emission results from the synergistic interaction of two complementary dyes embedded in the polymer matrix. By tuning the monomer and cross-linker composition, the system achieves balanced white light fluorescence with high transparency and flexibility, showcasing a matrix-centered approach to WLE design.

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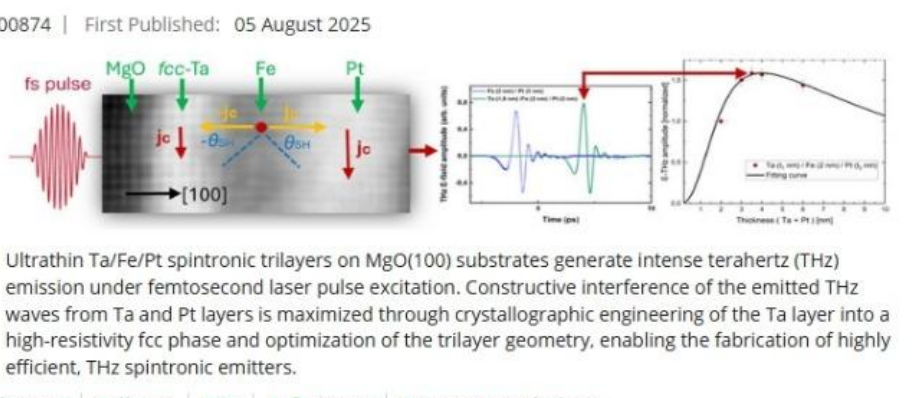
Enhanced THz Emission From Ultrathin Ta/Fe/Pt Spintronic Trilayers

Evangelos Th. Papaioannou, Laura Scheuer, Garik Torosyan, George P. Dimitrakopulos, Sławomir Kret, Alina D. Crisan, Ovidiu Crisan, René Beigang, Thomas Kehagias

e00874 | First Published: 05 August 2025



Ultrathin Ta/Fe/Pt spintronic trilayers on MgO(100) substrates generate intense terahertz (THz) emission under femtosecond laser pulse excitation. Constructive interference of the emitted THz waves from Ta and Pt layers is maximized through crystallographic engineering of the Ta layer into a high-resistivity fcc phase and optimization of the trilayer geometry, enabling the fabrication of highly efficient, THz spintronic emitters.

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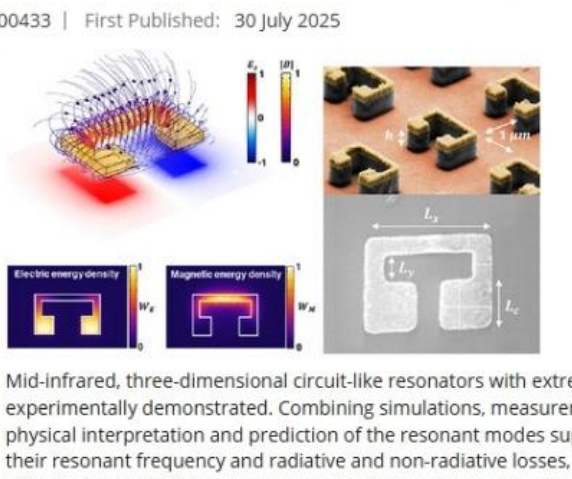
3D Meta-Atoms for High Confinement of Mid-IR Radiation

Francesco Pisani, Usama Iqbal, Laure Tailpied, Baptiste Fix, Isabelle Sagnes, Yanko Todorov

e00433 | First Published: 30 July 2025



Mid-infrared, three-dimensional circuit-like resonators with extreme field confinement are experimentally demonstrated. Combining simulations, measurements, and analytical modelling, a physical interpretation and prediction of the resonant modes supported by the structure, including their resonant frequency and radiative and non-radiative losses, is provided. These meta-atoms offer design flexibility and are promising for sensing, nonlinear optics, and strong light-matter interactions.

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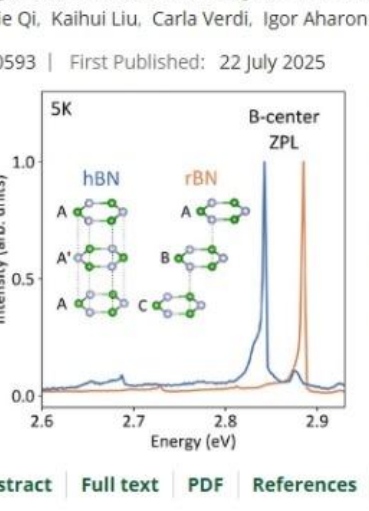
Quantum Emitters in Rhombohedral Boron Nitride

Angus Gale, Mehran Kianinia, Jake Horder, Connor Tweedie, Mridul Singhal, Dominic Scognamiglio, Jiajie Qi, Kaihui Liu, Carla Verdi, Igor Aharonovich, Milos Toth

e00593 | First Published: 22 July 2025



Rhombohedral boron nitride (rBN) is an emerging wide-bandgap van der Waals (vdW) material with strong second-order nonlinear optical properties. In this work, optically-addressable spin defects and single-photon emitters (SPEs) are fabricated deterministically in rBN. Emission spectra from hexagonal boron nitride (hBN) and rBN are compared, and computational models of defects in each polytype are used to elucidate the atomic structure of the B-center SPE.

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Direct Growth of Rectangular 2D Layered Metal-Halide Perovskite Microcrystal Photonic Cavities on Functional Substrates

Martina Borreani, Sudhir Kumar Saini, Alexander Schleusener, Roman Krahne

e01276 | First Published: 24 July 2025

PEA₂PbBr₄ powders in ACN and Toluene
Controlled Evaporation

A simple and scalable method to fabricate 2D layered metal halide microcrystals with rectangular shape, extremely flat surfaces, and submicron thickness is presented. The growth occurs in evaporating droplets on planar substrates, which enables the fabrication of the microcrystals directly on functional surfaces. The microcrystals demonstrate excellent optical properties in terms of refractive index, color purity, and emission wavelength tunability.

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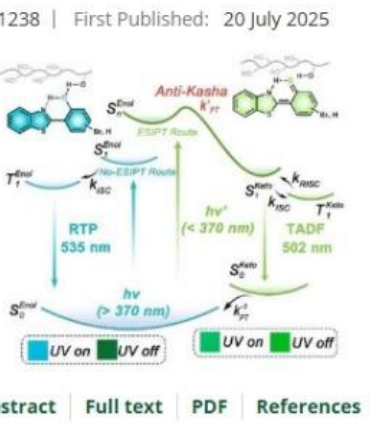
Multichannel Delayed Emission Based on Anti-Kasha Excited State Intramolecular Proton Transfer

Tao Li, Bingbing Ding, Zijin Chen, Ping Jiang, Zhenyi He, Ruijian Yan, He Tian, Jinquan Chen, Xiang Ma

e01238 | First Published: 20 July 2025



An effective strategy is developed to achieve anti-Kasha ESIPT by utilizing the energy barrier provided by the intermolecular hydrogen bond between ESIPT molecules and PVA. By changing the excitation wavelength, the configuration of Enol and Keto can be regulated respectively, which marks the first instance of photocontrollable TADF from Keto and RTP from Enol.

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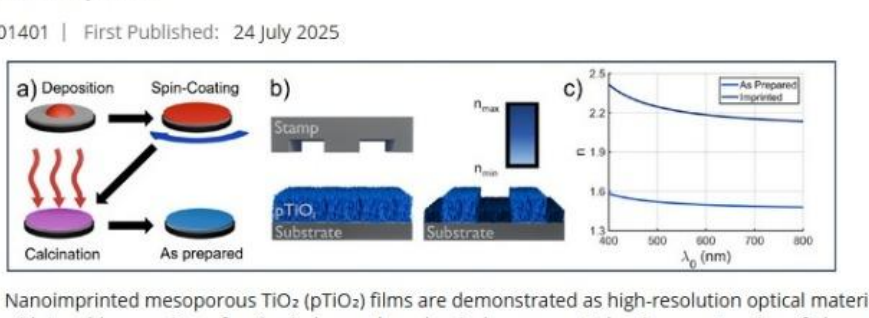
Nanoimprinting of Mesoporous Titania: Direct Patterning and Refractive Index Control in the Visible

Matthew Panipinto, Andrea Martinez Gomez-Aldaravi, David Ortiz de Zárate, Jaime García-Rupérez, Judson D. Ryckman

e01401 | First Published: 24 July 2025



Nanoimprinted mesoporous TiO_2 ($pTiO_2$) films are demonstrated as high-resolution optical materials with tunable porosity, refractive index, and mechanical response. Sub-micron patterning of planar optics is shown alongside a refractive index contrast Δn ≈0.7. This scalable technique provides a versatile route for fabricating high-resolution, visible-wavelength planar optics with potential for sensing, imaging, and integrated photonic applications.

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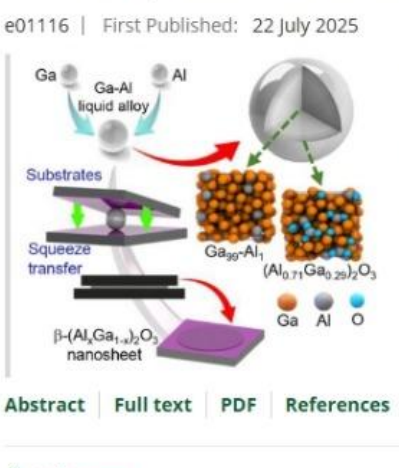
Bandgap Tuning of β-$(Al_xGa_{1-x})_2O_3$ Nanosheets via Liquid Metal Interface Engineering

Somayeh Rafiezadeh, Ali Zavabeti, Jianbo Tang, Andrew J. Christofferson, Nastaran Meftahi, Matthew R. Phillips, Kourosh Kalantar-Zadeh, Mohammad B. Ghasemian, Cuong Ton-That

e01116 | First Published: 22 July 2025



Ultrathin β-$(Al_xGa_{1-x})_2O_3$ nanosheets with controlled composition are synthesized via low-temperature squeeze-printing of Al—Ga liquid alloys. Aluminium preferentially migrates to the surface of the liquid alloy, forming Al-rich oxide layers with tunable bandgaps up to 6.4 eV. This compositionally precise approach enables the fabrication of 2D ultrawide-bandgap semiconductors for advanced deep-UV optoelectronic applications.

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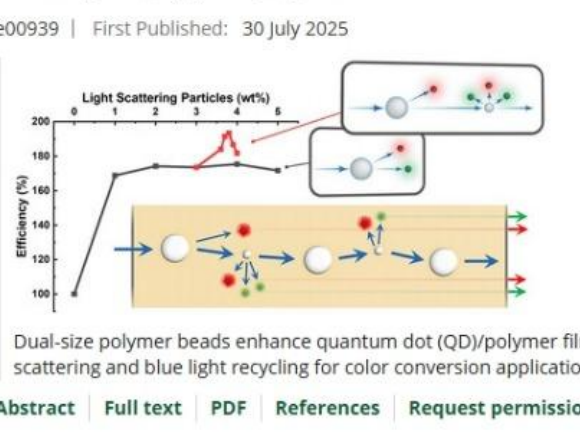
Intensifying Light Emission in Composite Quantum Dot/Polymer Color-Conversion Films via Blue Light Redirection and Recycling with Dual-Size Polymer Beads

Guan-Hong Chen, Tyng-Woei Jang, Hsueh-Shih Chen

e00939 | First Published: 30 July 2025



Dual-size polymer beads enhance quantum dot (QD)/polymer film efficiency via internal light scattering and blue light recycling for color conversion applications.

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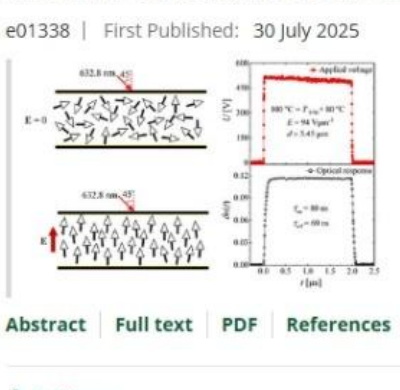
Submicrosecond Electric Switching of Large Birefringence in the Isotropic Phase of Ferroelectric Nematics

Kamal Thapa, Sathyanarayana Paladugu, Oleg D. Lavrentovich

e01338 | First Published: 30 July 2025



We demonstrate ultra-fast and efficient electro-optical switching using the isotropic phase of ferroelectric nematic liquid crystals. A moderate electric field induces a transition to polar ferroelectric nematic order, producing large field-induced birefringence with sub-microsecond switch-on and switch-off times. This advance enables new opportunities for fast-switching electro-optical devices such as shutters, modulators, optical retarders, and beam steerers.

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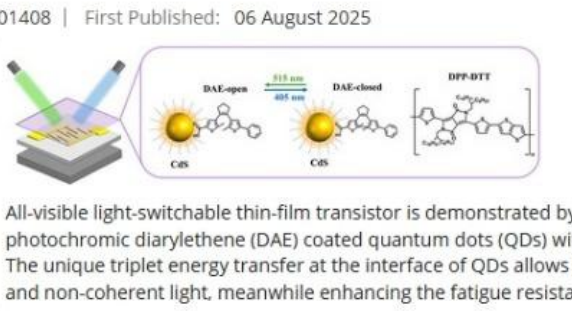
All-Visible Light-Switchable Thin-Film Transistor

Taibin Wang, Paolo Samorì, Lili Hou

e01408 | First Published: 06 August 2025



All-visible light-switchable thin-film transistor is demonstrated by incorporating blends of photochromic diarylethene (DAE) coated quantum dots (QDs) with p-type semiconducting polymer. The unique triplet energy transfer at the interface of QDs allows to activate DAEs using low-power and non-coherent light, meanwhile enhancing the fatigue resistance of the devices.

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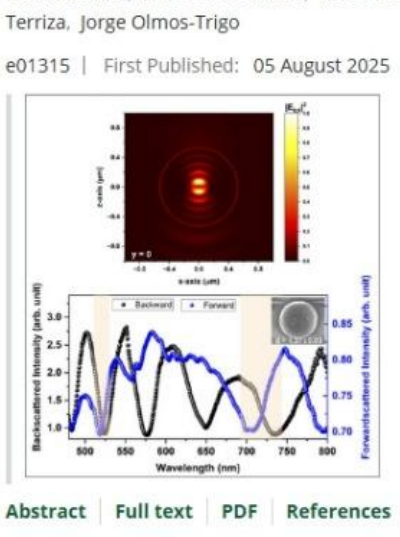
Detection of Hybrid Optical Anapoles in Dielectric Microspheres

Uttam Manna, Iker Gómez-Viloria, Robert Sevik, Isaac Tribaldo, Mahua Biswas, Gabriel Molina-Terriza, Jorge Olmos-Trigo

e01315 | First Published: 05 August 2025



In this work, hybrid optical anapoles are detected in dielectric microspheres using dual detection optical spectroscopy. The results show that the excitation of TiO2 microspheres under tightly focused Gaussian Beam illumination leads to the appearence of scattering minima in both the forward and backward directions within specific wavelength ranges.

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Controlling d^{10} Metal in Phenylthiourea-Based Hybrid Metal Halides to Actualize Dimensional Transformation and Significantly Improve the Birefringence

Yi-Lei Lv, Ru-Ling Tang, Liang Ma, Cheng Chen, Wenlong Liu, Sheng-Ping Guo

e01839 | First Published: 20 July 2025

(C₇H₈N₂S)₂CdCl₂ (0D)
(C₇H₈N₂S)HgCl₂ (1D)
Dimensional regulation
CdCl₂S₂ (0.17@546nm)
HgCl₂S (0.49@546nm)

From newly developed d^{10} metal hybrid halides ($(C_7H_8N_2S)_2CdCl_2$ to $(C_7H_8N_2S)HgCl_2$), the transformation from 0D structure to 1D structure is achieved. Consequently, the birefringence has enlarged from 0.17@546 to 0.49@546 nm, which is the highest experimental birefringence among metal halides or chalcohalides.

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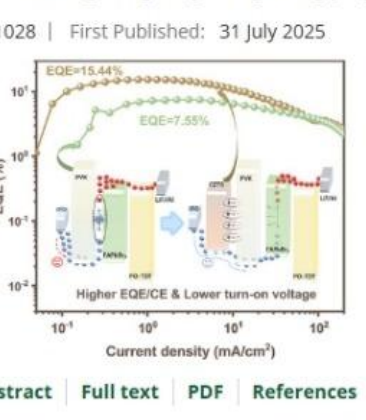
Interface Bridge Engineering for High Efficient Hole Injection in CZTS-Based Perovskite Light-Emitting Diodes

Maolin Mu, Wen Li, Lunyao Pan, Xiankan Zeng, Qungui Wang, Yongjian Chen, Chenglong Li, Di Shen, Xinning Wang, Shiyu Yang, Hongqiang Xin, Weiqing Yang

e01028 | First Published: 31 July 2025



After introducing the CZTS layer, the charge accumulation is reduced and the hole injection is enhanced, achieving higher current efficiency, lower turn-on voltage, and an external quantum efficiency that increases from 7.55% of the control device to 15.44% of the optimized device.

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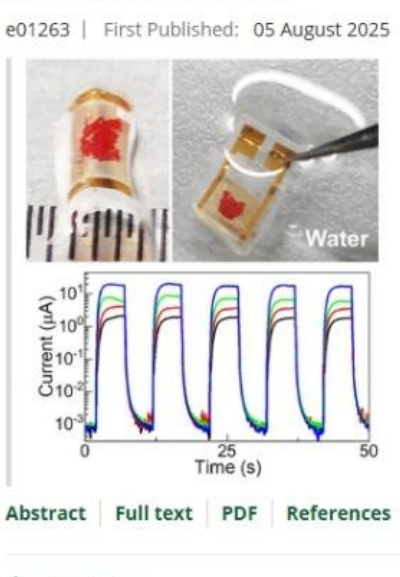
High-Anisotropic Flexible Photodetector Based on Centimeter-Sized $Cs_3Bi_2I_9$ Single-Crystal Sheet

Zhen Yu Zhang, Guo Ping Wang

e01263 | First Published: 05 August 2025



This study synthesizes centimeter-scale $Cs_3Bi_2I_9$ single-crystal sheets and develops a damage-free transfer technique, enabling their application on polyethylene terephthalate substrates to fabricate a flexible, water-resistant photodetector. The device exhibits the high anisotropic electrical performance of Bi-based perovskite materials and can achieve a switching ratio of 3.3×10^4.

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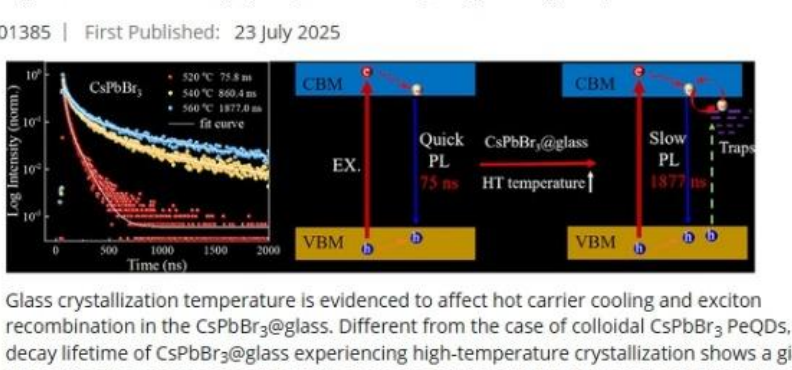
Ultralong Decay Lifetime for $CsPbBr_3$ Perovskite Quantum Dots Glass

Ronghua Chen, Bin Zhuang, Jidong Lin, Tao Pang, Lingwei Zeng, Daqin Chen

e01385 | First Published: 23 July 2025



Glass crystallization temperature is evidenced to affect hot carrier cooling and exciton recombination in the $CsPbBr_3$@glass. Different from the case of colloidal $CsPbBr_3$ PeQDs, the PL decay lifetime of $CsPbBr_3$@glass experiencing high-temperature crystallization shows a giant elongation from nanoseconds to microseconds, ascribing to the formation of defect states within the bandgap acting as carrier trapping centers.

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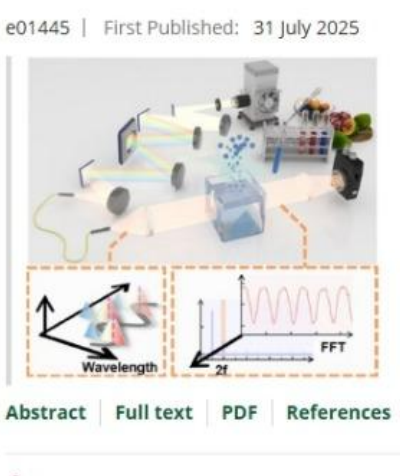
COSMOS: Correlation-Optimized Spectral Modulation Optical Sensing

Qingze Guan, Zi Heng Lim, Yixiu Shen, Guangya Zhou

e01445 | First Published: 31 July 2025



Correlation-optimized spectral modulation optical sensing (**COSMOS**) is proposed, a broadband correlation spectroscopy method designed for analytes with arbitrary absorption spectra. COSMOS addresses the limitations of laser-based techniques that target only sharp spectral peaks. The second-order harmonic (2*f*) response can be maximized by matching the illumination pattern to the second-order derivative of the absorption spectrum, thereby enhancing sensitivity and selectivity.

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Oligomerization-Induced Supramolecular Glass with Superior Processability and Optical Functions

Zixuan Liu, Lin Wang, Yang Yang, Peng Meng, Xiaodong Wang, Hang Meng, Dongchen Qi, Hongxia Wang, Xiaofeng Liu, Jingsan Xu

e01259 | First Published: 30 July 2025

Oligomerization-induced supramolecular glass (BGG) is formed via a catalyst-free melt-quenching strategy from benzoguanamine. The in situ formation of diverse oligomers suppresses crystallization, enabling glass formation. BGG exhibits a high T_g (100.1 °C), polymer-like modulus, and bright aggregation-induced emission, and is readily processed into films and fibers for photonic and hybrid applications.

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Magnetic Field Induced Circular Polarization of Photoluminescence from Manganese Doped Perovskites

Zhengwei Yang, Yu Zhang, Qingda Chang, Shuchun Zhang, Ji-Zhe Zhang, Chuang Zhang, Jiannian Yao

e00560 | First Published: 30 July 2025

In this work, dual magnetic circular polarization of luminescence (MCPL) is demonstrated in $BA_2Pb_{0.8}Mn_{0.2}Br_4$, where exciton and Mn^{2+} *d-d* emissions exhibit opposite CPL. The distinct electronic state characteristics result in the opposite handedness. This dual MCPL behavior is also observed in various Mn^{2+} doped perovskites and holds promise for novel optoelectronic and spintronic applications.

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