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ADVANCED OPTICAL MATERIALS

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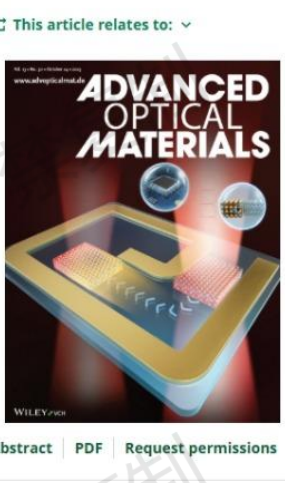
Controllable All-Optical Manipulation of 2D Photoacoustic Actuators on van der Waals Interfaces (Advanced Optical Materials 30/2025)

Yan Wang, Ivan M. Kislyakov, Yu Mao, Zhouyuan Yan, Jincheng Ji, Yibiao Hu, Zixin Wang, Jiajing He, Ningning Dong, Jun Wang

e70418 | First Published: 26 October 2025

This article relates to:



Light-Controlled 2D Photoacoustic Actuators
In the Research Article, Jiajing He, Ningning Dong, Jun Wang, and co-workers demonstrate precise and controllable optical manipulation of diverse 2D materials on van der Waals interfaces, enabling complex trajectory motion. This non-destructive approach offers a novel solution for optoelectronic device fabrication and extreme-performance chip development (DOI: 10.1002/adom.202501156).

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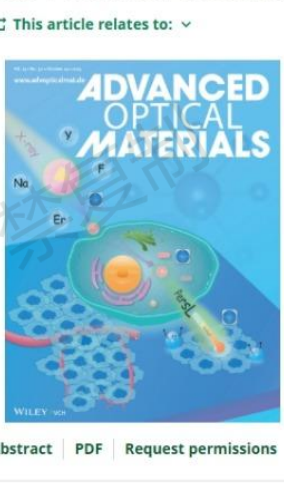
Persistent Luminescence Ratiometric Thermometry at the Nanoscale (Advanced Optical Materials 30/2025)

Leipeng Li, Peng Geng, Mengyao Huo, Chongyang Cai, Lukasz Marciniak, Yanmin Yang, Feng Wang

e70427 | First Published: 26 October 2025

This article relates to:



A PersL-Based Nanothermometer
A persistent luminescence (PersL)-based nanothermometer is developed, characterized by a core-shell nanostructure of $NaYF_4:Er^{3+}@NaYF_4$ with an average size of ~16.5 nm. It exhibits hour-long green PersL upon X-ray charging. At the PersL stage, the intensity ratio of $^2H_{11/2}\rightarrow{}^4I_{15/2}$ to $^4S_{3/2}\rightarrow{}^4I_{15/2}$ transitions of Er^{3+} can be used to monitor temperature changes, thus holding significant potential for diverse applications, such as intracellular temperature sensing. More details can be found in the Research Article by Leipeng Li, Feng Wang, and co-workers (DOI: 10.1002/adom.202502186).

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Issue Information

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Issue Information

e70422 | First Published: 26 October 2025

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Review

Full Access

Recent Advances in Design Strategies for Organic Photoactivatable Luminescent Materials

Xin Li, Xiao Li, Sheng-Yi Yang, Ryan Tsz Kin Kwok, Zhihong Guo, Zijie Qiu, Jacky Wing Yip Lam, Ben Zhong Tang

e01700 | First Published: 19 August 2025

Organic photoactivatable luminescent materials emerge as transformative tools across optoelectronics, biomedicine, and information technology, yet this field currently lacks comprehensive reviews that categorize the molecular design strategies. This review fills this critical gap by systematically discussing photochemical (photoisomerization, photocleavage, photodehydrogenation, photodimerization, and radical generation) and photophysical approaches (deoxygenation and molecular conformation/packing modulation), highlighting their mechanisms, advantages, and limitations.

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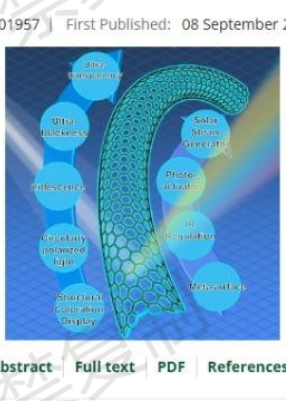
Programmable 1D Light–Matter Interaction: Unlocking the Optical Potential of Carbon Nanotubes

Yunqing Bu, Taishan Yin, Haoran Wei, Jiaqi Zhang, Yue Huang, Wenhan Cao, Zhongjie Huang

e01957 | First Published: 08 September 2025



Carbon nanotube-based advanced optical materials and technologies have been comprehensively reviewed, highlighting their programmability through unique unit structures, customizable orientation, and adaptable composite functionality, inspiring future innovations in a wide spectrum of smart applications.

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Recent Progress on Crystalline Organic Light-Emitting Diodes Based on Weak-Epitaxy-Growth 2FPPICz Polycrystalline Thin Films

Wenjing Li, Shuang Zhou, Feng Zhu, Donghang Yan

e02063 | First Published: 08 September 2025

This paper systematically summarizes the recent research progress on crystalline-organic-semiconductor OLEDs (C-OLEDs) with 2FPPICz crystalline host matrix. It focuses on analyzing the structure–property relationships among polycrystalline thin film characteristics, device architecture design, and performance metrics, and elaborates on the physical structure design of the light-emitting layer, including doping structures, solid-solution structures, and nanoaggregate structures. In addition, it discusses the unique advantages of C-OLEDs and analyzes the challenges they face.

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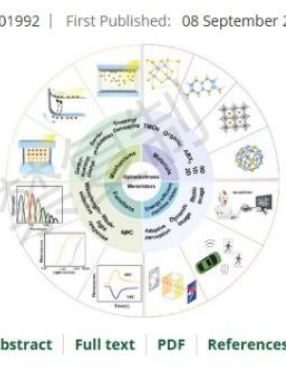
Toward Energy-Efficient Machine Vision: Advances in Optoelectronic Memristors

Shuaiwen Pan, Siqi Wu, Jianyu Ming, Haifeng Ling

e01992 | First Published: 08 September 2025



Optoelectronic memristors (OEMs) provide a platform that integrates sensing, memory, and computation, offering great potential for energy-efficient, real-time machine vision in edge intelligence. This review provides a critical overview of recent advances in material systems, physical mechanisms, and functional applications. Key challenges and future directions are discussed toward highly scalable and more energy-efficient neuromorphic machine vision.

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Water-Influenced Perovskite Materials: Crystal Transition, Stability Regulation, and Applications

Xudong Jin, Zongyang Li, Sheng Wang, Jingkun Wang, Wenbo Liu, Yukun Wu, Chengli Song, Min Zhao, Zhi Wang, Yuying Hao

e01785 | First Published: 08 September 2025

This review summarizes recent advances in water-influenced perovskite materials, examining water's influence on crystal structure, morphology, and optoelectronic properties. It discusses water-influenced synthesis methods and applications in perovskite devices, while addressing current challenges and future research directions.

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Recent Advances and Emerging Applications of Lanthanide/Transition-Metal-Ion-Doped Short-Wave Infrared Luminescent Materials

Shihai Miao, Yanjie Liang, Xiao-Jun Wang

e01928 | First Published: 08 September 2025

This paper systematically reviews the research progress of SWIR luminescent materials, categorizing them based on their luminescent centers—lanthanide ions, transition metal ions, and ion-pair co-doping—with a focus on inorganic phosphors capable of efficiently converting blue excitation light to broadband SWIR emission.

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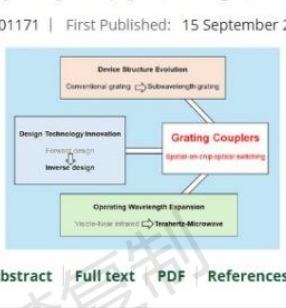
Progress of Grating Couplers for Light Exchange between Space and On-Chip

Lvyi Zhong, Maoqing Guo, Shilong Li, Yuhang Chen, Jie Li, Jitao Li, Dingyu Yang

e01171 | First Published: 15 September 2025



This review aims to review the development of grating couplers for spatial–on-chip optical switching from multiple perspectives, including three aspects: structure, design methods, and operating wavelengths. The developments of subwavelength grating coupling, inverse design, and terahertz–microwave couplers are commented. This paper interprets the development of grating couplers from a diversified perspective, helping researchers gain a comprehensive understanding of this field.

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Research Article

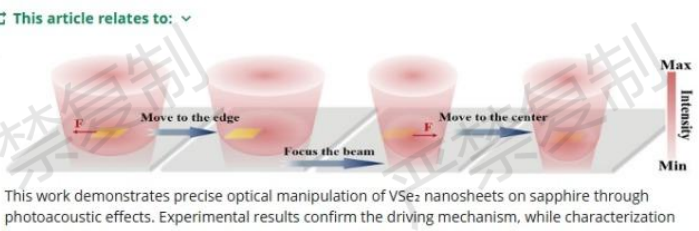
Full Access

Controllable All-Optical Manipulation of 2D Photoacoustic Actuators on van der Waals Interfaces

Yan Wang, Ivan M. Kislyakov, Yu Mao, Zhouyuan Yan, Jincheng Ji, Yibiao Hu, Zixin Wang, Jiajing He, Ningning Dong, Jun Wang

e01156 | First Published: 07 July 2025

This article relates to:



This work demonstrates precise optical manipulation of VSe_2 nanosheets on sapphire through photoacoustic effects. Experimental results confirm the driving mechanism, while characterization shows nondestructive operation. Laser intensity and substrate interactions critically influence the motion. Programmed control enables automated nanosheet movement, advancing optoelectronic device development with this versatile manipulation technique.

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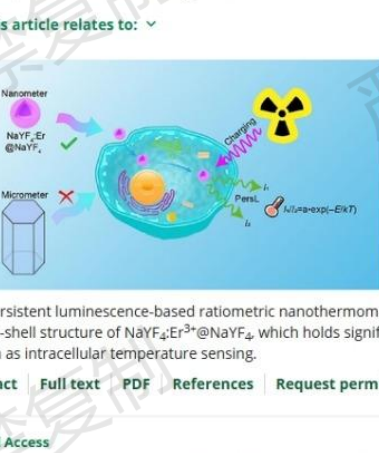
Persistent Luminescence Ratiometric Thermometry at the Nanoscale

Leipeng Li, Peng Geng, Mengyao Huo, Chongyang Cai, Lukasz Marciniak, Yanmin Yang, Feng Wang

e02186 | First Published: 18 August 2025

This article relates to:



A persistent luminescence-based ratiometric nanothermometer is developed, characterized by a core-shell structure of $NaYF_4:Er^{3+}@NaYF_4$, which holds significant potential for diverse applications, such as intracellular temperature sensing.

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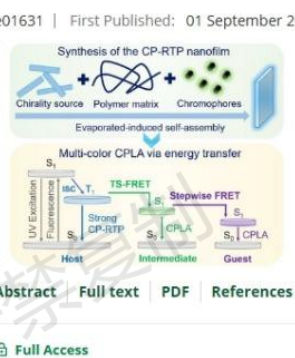
Circularly Polarized Ultralong Room-Temperature Phosphorescence and Multi-Color Afterglow via the Stepwise Energy Transfer

Shengzhe Jia, Bingbing Yang, Jing Du, Weiwei Tang, Junbo Gong

e01631 | First Published: 01 September 2025



This work synthesizes the CP-RTP nanofilm through the co-assembly of the CNCs, PVA, and the chromophore, with excellent CPL and ultralong lifetime. Then, this work designs a stepwise energy transfer routine by importing an intermediate to bridge the host's film and terminal guests and realize the long-distance energy transfer, thus realizing the multi-color CPLA effects.

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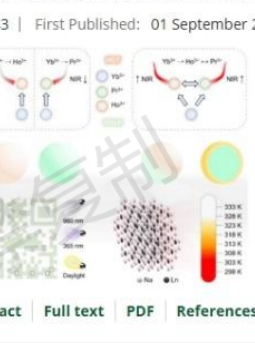
Engineering Ho^{3+}-Mediated Energy Transfer for Enhanced Pr^{3+} NIR-II Luminescence in Core–Shell Nanocrystals toward Ultrasensitive Temperature Sensing

Kejie Li, Haikuo Liu, Zhiying Wang, Mengmeng Dai, Jiaqi Zhang, Zuoling Fu

e02343 | First Published: 01 September 2025



The unique strategy of engineering Ho^{3+}-mediated energy transfer for enhanced Pr^{3+} NIR-II luminescence in $NaYF_4$ core–shell nanocrystals is introduced. By optimizing the concentration ratio and spatial distribution of these lanthanide ions, the thermal quenching of downshifting emission are suppressed. This approach enables high-sensitivity temperature sensing and multimodal anti-counterfeiting applications, providing a novel pathway for lanthanides biological application and security technologies.

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Ultra-Linear Power Dependency of Photon Release in $Cs_2NaInCl_6$: Ho^{3+}/Yb^{3+} for Multifunctional Integration of Flexible Temperature Sensing and NIR Bioimaging

Xiaolong Dong, Xin Zhao, Lifan Shen, Maosen Hu, Edwin Yue Bun Pun, Hai Lin

e01849 | First Published: 03 September 2025

A strong power-dependent quantum yield behavior is observed in $Cs_2NaInCl_6$: Ho^{3+}-Yb^{3+} phosphors with ultra-low phonon energy. To leverage this property and address limitations of bulk phosphors, the perovskite is embedded into fibers and 453 and 980 nm lasers are coupled to construct a bidirectional energy transfer integrated platform, which enables selective applications for flexible thermal monitoring and NIR bioimaging.

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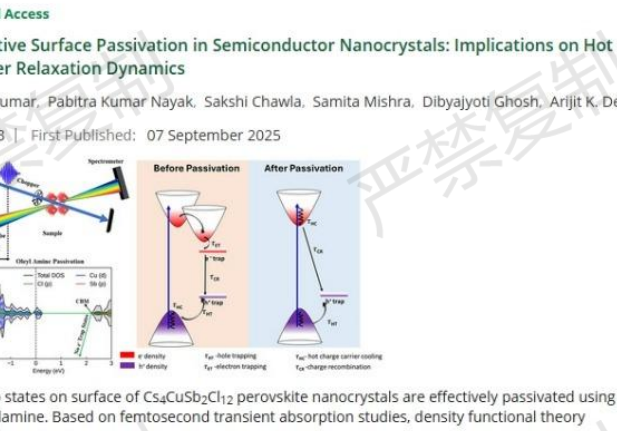
Selective Surface Passivation in Semiconductor Nanocrystals: Implications on Hot Carrier Relaxation Dynamics

Amit Kumar, Pabitra Kumar Nayak, Sakshi Chawla, Samita Mishra, Dibyajyoti Ghosh, Arijit K. De

e01203 | First Published: 07 September 2025



Trap states on surface of $Cs_4CuSb_2Cl_{12}$ perovskite nanocrystals are effectively passivated using oleylamine. Based on femtosecond transient absorption studies, density functional theory calculations, and other supporting methods, it is inferred that oleylamine selectively removes only electron trap states, thereby significantly influencing the rates of ultrafast hot-carrier relaxation dynamics, which is crucial for tuning the photovoltaic efficiencies of perovskite-based optoelectronic devices.

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Photogeneration of Long-Lived and High-Mobility Charge Carriers in Graphene via Doped $MoSe_2$ Interface

Xiaojing Liu, Dawei He, Xiaoxian Zhang, Fangying Ren, Jiaqi He, Yongsheng Wang, Hui Zhao

e01955 | First Published: 03 September 2025

Photogeneration of long-lived charge carriers in graphene is achieved by constructing a heterostructure with a p-type-doped $MoSe_2$ monolayer. The electric field arising from background hole transfer confines photoexcited holes within $MoSe_2$, preventing their recombination with electrons in graphene. This strategy offers a pathway to developing novel optoelectronic materials based on graphene heterostructures.

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Interface-Driven Enhancement of Photoluminescence and Second-Harmonic Generation in InSe on Epitaxial TiN

Kai-Bo Liang, Chia-Hao Lin, I-Hung Ho, Yu-Jung Lu, Shangjr Gwo, Hyeyoung Ahn

e01930 | First Published: 03 September 2025

TiN epilayers grown by molecular-beam epitaxy offer reflectivity comparable to Au films but with superior thermal stability. When coupled with InSe, the InSe/TiN heterostructure exhibits remarkable enhancements in both photoluminescence and second-harmonic generation compared to SiO_2. These enhancements are attributed to strong electric field localization within the InSe layer, enabled by an unusual interface interaction with the highly reflective TiN.

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Rare Earth Ion-Doped Metal Halide Perovskite Miro-Nano Single Crystals for Low Threshold Perovskite Lasers

Yunxia Ma, Yijun Wang, Wei Liu, Jiahuan Ren, Daqing Yang, Leipeng Li, Linjuan Guo, Shufang Wang, Zheng Yang

e01595 | First Published: 03 September 2025

Rare-earth co-doping engineering (Ce^{3+}/Er^{3+}) enables ultralow-threshold perovskite lasers (1.5 μJ cm^{-2}) – a 6-fold reduction from pristine $CsPbBr_3$. This breakthrough stems from synergistic effects: i) surface defect passivation suppressing non-radiative recombination, ii) lattice contraction widening bandgaps and enhancing exciton binding, and iii) efficient Förster resonance energy transfer (FRET) between dopants. Demonstrated universally in wide-bandgap Br^-/Cl^--MHPs via single-crystalline microribbon platforms.

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UV/NUV and BW-I Mechanoluminescence from Bi-Activated $CaY_2Ge_4O_{12}$ Polycrystals

Hossein Ebrahim Hosseini, Jiangkun Cao, Marzieh Ghadamyari, Dušan Galusek, Róbert Klement, Lothar Wondraczek

e01673 | First Published: 03 September 2025

UV/NUV and NIR triple-band pPL from $CaY_2Ge_4O_{12}$:Bi crystal is achieved by doping with a single element. Dual-stimulus-responsive (DSR) luminescence, triggered by impact and scratching, is observed from the same compound.

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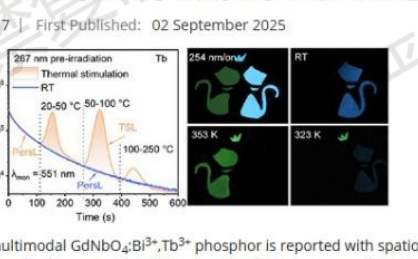
Multidimensional Dynamic Information Display Based on Long Persistent Phosphors via Wavelength Multiplexing Coupled with Trap Management

Wenna Gao, Liangshen Wang, Yuqiang Wang, Wenqian Xu, Xiangyu Zhang, Dangli Gao

e01517 | First Published: 02 September 2025



A multimodal $GdNbO_4$:Bi^{3+},Tb^{3+} phosphor is reported with spatiotemporally tunable colorimetry. Uniquely, this material enables transient luminescence color switching and spatial temperature mapping by temperature-controlled carrier dynamics process. The dynamic PersL mechanism is proposed. This work establishes a dynamic multilevel information storage and anti-counterfeiting paradigm by using trap management and wavelength multiplexing.

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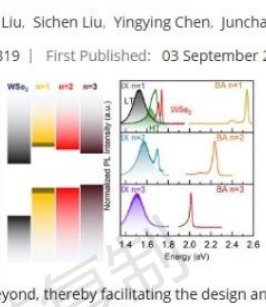
Probing Phase Distribution at the Surface of $(BA)_2(MA)_{n-1}Pb_nI_{3n+1}$ Perovskite Film via Interlayer Exciton Emission

Zeyi Liu, Sichen Liu, Yingying Chen, Junchao Hu, Haizhen Wang, Yao Gao, Dehui Li

e01819 | First Published: 03 September 2025



Quasi- two dimensional (2D) halide perovskite films often exhibit mixed n-value phases with random surface distributions, critically impacting device performance. Probing such surface phase distribution remains challenging. Here, a method utilizing interlayer excitons (IXs) emission in $(BA)_2(MA)_{n-1}Pb_nI_{3n+1}/WSe_2$ heterostructures is introduced to map the n-value phase distribution. The study offers an effective and convenient approach for probing the local n value at the surface of perovskite film at the micrometer scale and beyond, thereby facilitating the design and improvement of quasi-2D perovskite films for optoelectronic devices.

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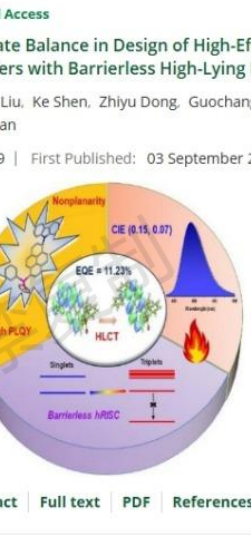
Delicate Balance in Design of High-Efficiency and Heat-Tolerant Deep Blue OLED Emitters with Barrierless High-Lying Reverse Intersystem Crossing

Yujian Liu, Ke Shen, Zhiyu Dong, Guochang Yue, Kuan Wang, Zhiqiang Gao, Baoxiu Mi, Quli Fan, Yan Qian

e01149 | First Published: 03 September 2025



Through a careful balance of luminescence wavelength, PLQY, and transition character, two deep blue OLED emitters based on carbazolylpyrenyl phosphine oxides are developed, achieving a maximum EQE of 11.23% and CIE coordinates of (0.15, 0.07). Different singlet-triplet transition characters enable efficient hRISC channels with no barriers, contributing to the OLEDs' high efficiency and superior thermal stability.

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Epitaxial Self-Assembled Vertically Aligned Nanocomposite Photoelectrodes with Tunable Ambipolar Response

Ron Fishov, Alexander Rashkovskiy, Vladimir Ezerski, Daniel A. Grave

e01778 | First Published: 08 September 2025

Ambipolar photoelectrodes enable controlled switching between anodic and cathodic photocurrents in response to light and applied potential. This work demonstrates epitaxial self-assembled vertically aligned $NiTiO_3$–TiO_2 nanocomposite thin films with tunable ambipolar behavior. These findings establish a platform for switchable photoelectrodes, offering new insights into mixed-phase oxide design for PEC logic and optoelectronic applications.

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Nanoscale Welding and Strain-Engineered Photoluminescence of GaN Nanowires

Vladislav Sharov, Alexander Pavlov, Ilya Eliseyev, Mikhail Moskalev, Sergey Komarov, Kristina Novikova, Prokhor Alekseev, Akanksha Kapoor, Joël Eymery, Christophe Durand, Maria Tchernycheva, Valery Davydov, Ivan Mukhin

e01821 | First Published: 15 September 2025

Individual epitaxial GaN nanowires are elastically strained with AFM probe. Photoluminescence (PL) signal from them is mapped. Strain-induced PL broadening is detected. Band structure of strained GaN is calculated, linear PL shift coefficients for uniaxial compression and tension are found.

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Diversified Synthesis of 0D Hybrid Indium Halides Crystal Structure and PLQY Enhancement via Solvent Environment Regulation and Sb^{3+} Doping

Zeyu Wang, Zheyuan Da, Xiaoliang Chen, Jindou Shi, Qing Yao, Chen Zhang, Junnan Wang, Xiangming Li, Minqiang Wang

e00882 | First Published: 19 September 2025

By adjusting the solution environment while using the same raw materials, three new zero-dimensional hybrid indium based chlorides were synthesized, including γ-$(HMTA)^{3+}$InCl6 (HMTA = hexamethylenetetramine), α-(HMTA3+)InCl6, and (C7H15N4+)[InCl4 (DMSO)2] (DMSO = dimethylsulfoxide). These materials are facilitated by Sb3+ doping, which broadens the excitation band. Under UV excitation, the doped compounds exhibit bright self-trapped exciton emissions with different colors enhanced photoluminescence quantum yield.

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Secondary Coordination Sphere-Directed Design of Thermo-Responsive and Bright Luminescent Manganese(II) Complexes

Masaki Yoshida, Fuwenhan Zhang, Kaito Segawa, Kanon Komoda, Kodai Yuasa, Hiromu Obata, Nobuto Yoshinari, Masako Kato

e02008 | First Published: 02 September 2025

Luminescent manganese(II) complexes with modified secondary coordination spheres exhibit remarkably high emission quantum yields and distinct chromic behavior. The introduction of steric and functional groups enhances emission efficiency and enables temperature dependent emission color changes through reversible intramolecular interactions in the excited state, offering a new strategy for designing responsive photofunctional materials based on earth abundant metals.

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Common Characteristics of Materials Exhibiting Photoinduced Blackbody Behavior

Hao Cui, Shuang Wu, Weiping Qin

e01753 | First Published: 05 September 2025

Two key prerequisites for Photoinduced Blackbody transformation are determined through inductive analysis. Under strong excitation, D-orbital electrons promote high-frequency vibrational coupling among cations, anions, and electrons. Photodynamic analysis indicates that broadband light absorption occurs earlier than PB radiation and persists in a temperature-dependent manner. How forced electromagnetic vibration and anharmonic electron–phonon coupling govern PB behavior is elucidated.

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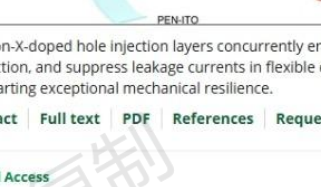
Triton-X Engineered Hole-Injection Layer Enabled Efficient Flexible Quantum Dot Light-Emitting Diodes

Jiaqi Li, Linhan Fan, Jusen Bai, Lin Zhang, Jianjun Tian

e01635 | First Published: 03 September 2025



Triton-X-doped hole injection layers concurrently enhance interfacial wettability, reinforce hole injection, and suppress leakage currents in flexible quantum-dot light-emitting diodes, while imparting exceptional mechanical resilience.

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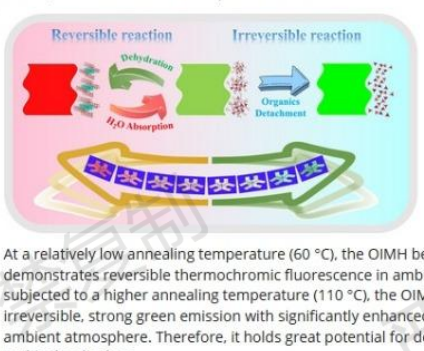
The Transition Mechanism and Multifunctional Applications in Vapochromic Organic–Inorganic Mn-Based Halides

Weidong Cai, Xinyu Ma, Qiang Guo, Liang Gao, Muyi Zhang, Lin Yang, Zhijun Gao, Yang Liu, Yilong Qin, Xinsheng Cao, Shengyiye Yue, Yiqiang Zhan

e00935 | First Published: 03 September 2025



At a relatively low annealing temperature (60 °C), the OIMH becomes sensitive to the moisture and demonstrates reversible thermochromic fluorescence in ambient atmosphere. While being subjected to a higher annealing temperature (110 °C), the OIMH becomes quite steady and shows an irreversible, strong green emission with significantly enhanced green emission and high stability in ambient atmosphere. Therefore, it holds great potential for development in the field of flexible multicolor displays.

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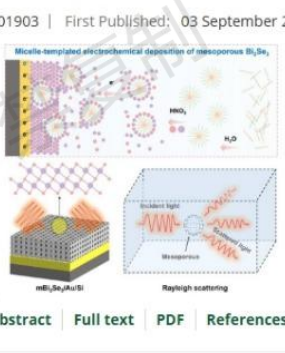
Programmable Micelle Templated Electrochemical Deposition Synthesis of Mesoporous Chalcogenide Semiconductors Thin Film for High-Performance Photodetector

Tuo Zhang, Yuan Ren, Xueqiong Cui, Zhenliang Li, Yujian Rao, Zejun Han, Qiongfeng Shi, Li Tao

e01903 | First Published: 03 September 2025



A programmable synthesis of highly crystalline mesoporous Bi_2Se_3 (mBi_2Se_3) films with tunable pore size, porosity, film thickness, and crystallinity, by micelle-templated electrochemical deposition is demonstrated. The mBi_2Se_3/Au/Si heterojunction show excellent photodetectors performances due to mesoporous structure enhanced light absorption, showing great potential in high-resolution infrared imaging and industrial anomaly detection.

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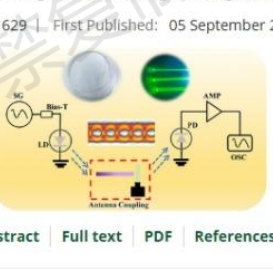
Optical Wireless Communication System Based on a Perovskite Fluorescent Antenna

Wei Wang, Yue Cao, Chengwei Wang, Lei Zhang, Xueyao Lu, Jiaqi Wu, Feng Chen, Feifei Qin

e01629 | First Published: 05 September 2025



Optical wireless communication system is demonstrated with signal generator (SG), laser diode (LD) source, fluorescent antenna coupled photodetector (PD), signal amplifier (AMP) and oscilloscope (OSC).

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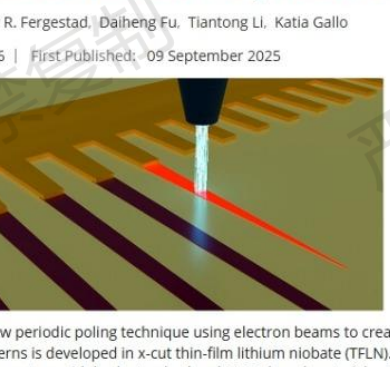
High-Resolution Electron-Beam Poling of X-Cut Lithium Niobate Thin Films

Halvor R. Fergestad, Daiheng Fu, Tiantong Li, Katia Gallo

e01126 | First Published: 09 September 2025



A new periodic poling technique using electron beams to create stable, high-quality ferroelectric patterns is developed in x-cut thin-film lithium niobate (TFLN). The method works at room temperature with both standard and MgO-doped materials, affords ferroelectric domain pitches as small as 375 nm, and lends itself to seamless integration with state-of-the-art TFLN photonic circuits.

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Modular Hydrogel-Based Nano-Bead Emitters for Bright, Homogeneous Fluorescent Thin Films and 3D Architectures

Ilya Olevsko, Maria Shehadeh, Lakshmanan Eswaran, Dmytro Ohorodniichuk, Eti Teblum, Moshe Feldberg, Leonid Weisman, Rotem Golan, Fabrice Licata, Martin Oheim, Gerardo Byk, Adi Salomon

e02454 | First Published: 01 September 2025

NBE provide a versatile platform for creating bright, homogeneous thin films (<10 nm) and complex 3D architectures. Their modular design allows the incorporation of virtually any dye, enabling stable, reproducible, and scalable fabrication. This simplicity and flexibility open new opportunities for optical materials, imaging, and bio-related applications where uniformity and brightness are essential.

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Colorful Persistent Luminescence Induced by Inorganic-Polymer Hybridization

Shu-Yue Yang, Tuo-Yu Zhou, Sheng-Hua Li, Guang-Yue Li, Ling-Jia Jiang, Wen-Long Shang, Yang-Yang Qi, Tong-Yu Zhang, Jiuyuan Li, Qian Zhao

e01762 | First Published: 03 September 2025

Enabling conventional polymers to emit RTP remains a formidable challenge, especially with physical modifications. This work proposes a novel strategy to make PET or even recycled PET as efficient luminophores and constructs a series of inorganic-polymer-based Class I hybrids with prominent afterglow in different colors. Based on these properties, various applications are developed through solution processes and molding processes, and high-level dynamic encryption is established by a luminescent magic cube.

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Highly Luminescent Hybrid Europium(II) Bromide for Electrically Driven Light-Emitting Diodes

Ziying Wen, Li Huang, Yunfei Bai, Qichao Meng, Hongjuan Zhao, Haibo Sun, Chao Li, William W. Yu, Jun Zhu, Feng Liu

e01735 | First Published: 03 September 2025

(BTEA)EuBr₃ (BTEA = benzyltriethylammonium) single crystals are prepared through a facile slow vaporization crystallization method. The strong covalency between neighboring Eu contributes to enhanced structural stability. The highly efficient sky-blue emission with a photoluminescence quantum yield of ≈88% can be observed, making Eu^{2+} achieve blue electroluminescence emission in electrically-driven light-emitting diodes.

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Thermally Responsive White Circularly Polarized Light from Elastic Chiral Crystals via Dual Fluorescence-Phosphorescence

Xuzhong Pan, Linfeng Lan, Yupei Qu, Yue Wang, Hongyu Zhang

e02121 | First Published: 03 September 2025

By dynamically tuning the ratio of blue fluorescence (455 nm) and yellow phosphorescence (555 nm) through temperature control, single-component chiral crystals exhibiting intrinsic white circularly polarized luminescence (WCPL) are obtained, achieving ideal white-light emission with CIE coordinates of (0.32, 0.33). These crystals exhibit mechanical flexibility and, combined with their fluorescence-phosphorescence emission properties, enable flexible white-light waveguides (CIE: 0.31, 0.33) with spatiotemporal transmission control, offering promising applications in flexible optical devices.

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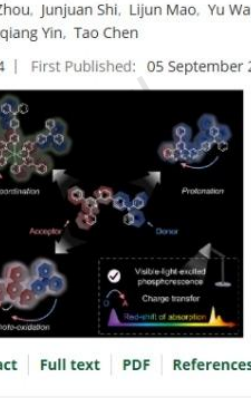
Achieving Long-Lived Visible-Light-Excited Phosphorescence Through Orchestrating Charge Transfer in Terpyridine-Based Donor–Acceptor Fluorophores

Jiayin Zhou, Junjuan Shi, Lijun Mao, Yu Wang, Wuzhen Luo, Min Qi, Longqiang Li, Ming Wang, Guangqiang Yin, Tao Chen

e01684 | First Published: 05 September 2025



An effective strategy is proposed to obtain visible-light-excited phosphorescence (VEP) via controllably manipulating charge transfer in donor-acceptor (D-A) engineered fluorophores. The ingenious D-A framework enables dynamic metal-ligand coordination, sequential protonation, and photo-oxidation, inducing a significant bathochromic absorption shift. As a result, tunable and multicolor VEP materials can be efficiently achieved for time-gated anti-counterfeiting and multi-level encryption.

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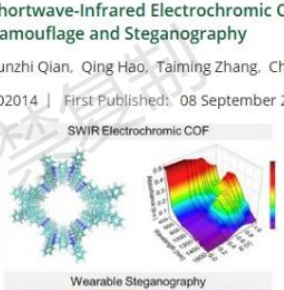
Shortwave-Infrared Electrochromic Covalent Organic Frameworks for Active Dynamic Camouflage and Steganography

Yunzhi Qian, Qing Hao, Taiming Zhang, Chao Zhao, Hong Liu

e02014 | First Published: 08 September 2025



Based on molecular engineering, the wavelength-controllable short-wave infrared (SWIR) electrochromic covalent organic frameworks (COFs) are designed for dynamic camouflage and steganography applications. By leveraging the concealment and penetrability of SWIR light, wearable steganographic equipment that is physically obscured from the naked eye and visible only to SWIR observers is developed.

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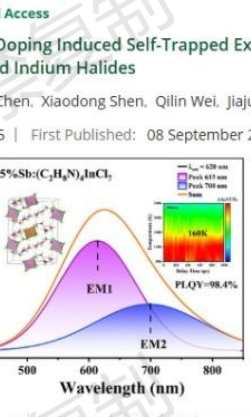
Sb^{3+}-Doping Induced Self-Trapped Excitons and Ultrafast Carrier Dynamics in 0D Hybrid Indium Halides

Linglu Chen, Xiaodong Shen, Qilin Wei, Jiajun Cao, Bingsuo Zou

e00835 | First Published: 08 September 2025



Sb^{3+} doping in 0D $(C_7H_8N)_3InCl_6$ enables dual STE emission: Sb^{3+}-site STE and In-Sb DAP. Phonon-assisted enhancement at 160 K (111.2 cm^{-1}) boosts DAP emission, achieving 98.4% PLQY for efficient broadband luminescence.

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Transition-Metal Azo Schiff Base Complexes: Nonlinear Optics Across Solutions, Thin Films and Nanocomposites

Karolina Waszkowska, Mark Busch, Siham Slassi, Amina Amine, Abdelkrim El-Ghayoury, Janusz Strzelecki, Anna Zawadzka, Andriy V. Kityk, Patrick Huber, Bouchta Sahraoui

e00975 | First Published: 04 September 2025

The excitation of a transition metal azo Schiff-base complex with a 1064 nm laser induces a series of nonlinear optical effects. These effects include the second harmonic generation at 532 nm and third harmonic generation at 355 nm. This process demonstrates the potential of the complex for high-order nonlinear optical applications.

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Self-Powered PbS CQDs Photodiode for High-Resolution Underwater NIR Single-Pixel Imaging

Yunbo Lu, Xin Wang, Yaqi Zhao, Haolan Xu, Hang Xia, Chen Wang, Shirong Chen, Gaobin Xu, Xinzheng Lan, Yongqiang Yu

e01654 | First Published: 08 September 2025

The high-resolution underwater NIR single-pixel imaging is successfully achieved by using a high-performance self-powered PbS CQDs photodetector both in transmission and reflection modes. It is noteworthy that high-quality images with a signal-to-noise ratio greater than 20 dB are obtained, even in turbid water conditions.

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Halide Passivation of PbS Quantum Dots in Glass for Highly Efficient NIR LEDs

Jingjing Liu, Jiahui Wei, Wenchao Zhang, Jong Heo, Chao Liu

e02173 | First Published: 09 September 2025

Mixed-halide passivation enhances PbS QD NIR emission (900–1800 nm) in glass, achieving 86.6%/60.4% internal/external quantum efficiencies, improved thermal/photo stability (~65% PL at 373 K, 3× higher saturation power) enables NIR-LED applications in bio-imaging, night vision, and encryption.

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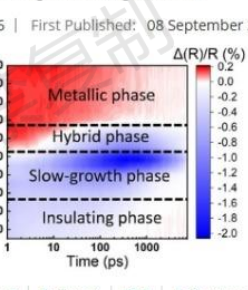
Dynamic Control of Photoresponse in VO_2 Through Phase Manipulation

Hao-Yu Cheng, Ming-Jyun Ye, Lu-Hsing Chen, Yen-Yu Wang, Shi-Wei Chu, Yen-Lin Huang, Yu-Jung Lu, Kuo-Ping Chen, Kung-Hsuan Lin

e01935 | First Published: 08 September 2025



By investigating the transient photoresponses of a VO_2 thin film at different temperatures, additional slow-growth and hybrid phases are discovered between the insulating phase at low-temperature and metallic phase at high-temperature. Through phase manipulation, the controllability of the amplitude and relaxation time is demonstrated in the range of a few tens of picoseconds and a few nanoseconds.

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Surface Lattice Resonances Enable Spatially Unified Perovskite Lasing

Jingyue Yu, Yungao Chen, Xinyu Wen, Qinglin Ji, Kangkang Guo, Shaobin Zheng, Wei Shao, Jinghui Gao, Shikai Deng

e01046 | First Published: 08 September 2025

Chemical vapor deposited perovskite lasers face structural imprecision, requiring precise optical alignment. Ag nanoparticle lattices can be integrated with perovskite to create hybrid lattice nanolasers. Surface lattice resonances induced by standing waves formed by oscillations of adjacent Ag nanoparticles enable subwavelength optical confinement and homogenized optical fields, achieving spatially unified lasing, and thus eliminating the need for location-specific pumping.

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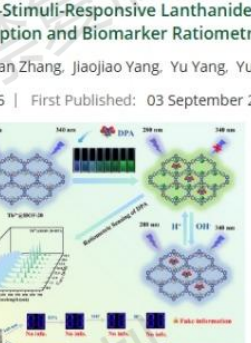
Multi-Stimuli-Responsive Lanthanide-Functionalized HOFs for Multi-Level Information Encryption and Biomarker Ratiometric Probe

Xiaoman Zhang, Jiaojiao Yang, Yu Yang, Yuting Yang, Lingxue Li, Lin Zhang, Yabing He, Dian Zhao

e01865 | First Published: 03 September 2025



By introducing stimuli-responsive photonic units (SRPUs) into HOF-20, the composite exhibits dynamic fluorescence properties under three stimuli (DPA concentration, excitation wavelength, pH value). This smart optical material has applications in multi-level information encryption as well as highly sensitive fluorescence sensing of DPA.

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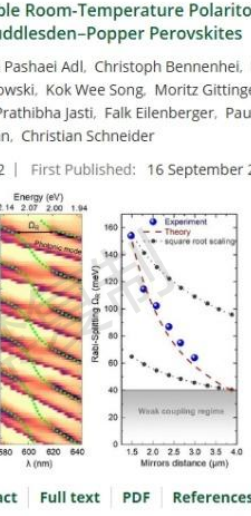
Tunable Room-Temperature Polaritons in the Very Strong Coupling Regime in Quasi-2D Ruddlesden–Popper Perovskites

Hamid Pashaei Adl, Christoph Bennenhei, Marti Struve, Paulina Peksa, Mateusz Dyksik, Michal Baranowski, Kok Wee Song, Moritz Gittinger, Christoph Lienau, Jonas K. König, Jamie M. Fitzgerald, Naga Pratibha Jasti, Falk Eilenberger, Paulina Plochocka, Ermin Malic, Oleksandr Kyriienko, Martin Esmann, Christian Schneider

e01392 | First Published: 16 September 2025



The study reports widely tunable room-temperature exciton polaritons in quasi-2D perovskite microcavities operating at the transition between strong and very strong coupling regimes. These experimental and theoretical insights explain the peculiar scaling behavior of the light–matter coupling in our tunable system, paving the way for future tunable polaritonic and nonlinear optical applications.

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From Two-Photon Grayscale Lithography to Scalable Replication: Enabling Complex Aspherical Micro-Optics for Mass Production

Stefan Wagner, Leander Siegle, Stephan Haeusler, Philipp Flad, Mario Henschel, Thomas Guenther, André Zimmermann, Harald Giessen

e02089 | First Published: 08 September 2025

This study presents the replication of micro-optics fabricated by two-photon polymerization grayscale lithography via electroplating and injection molding, enabling mass production without loss of precision. A diffractive aspherical micro-lens array is fabricated and replicated, and its performance is compared before and after replication, demonstrating the scalability and quality of 2GL-based injection molding.

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Kinetic-Controlled Perovskite Surface Smoothing to the Pixel-Level Uniformity for High-Resolution X-Ray Flat-Panel Imaging

Wanshun Yang, Wei Qian, Shanshan Yu, Han Li, Duan Huang, Haoyu Men, Weijing Zuo, Shihe Yang

e01891 | First Published: 08 September 2025

A kinetically controlled spray-recrystallization strategy transforms rough, defect-prone $MAPbI_3$ films into smooth, uniform layers with suppressed Pb-rich phase and trap density. Integrated with an indium gallium zinc oxide thin-film transistor backplane, the smoothed films enable pixel-level uniformity and stable, high-resolution flat-panel X-ray imaging.

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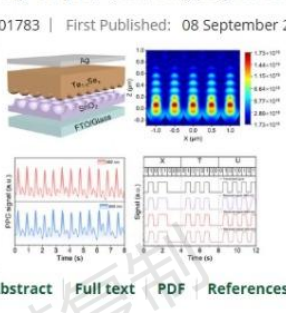
High-Performance Inverse Opal $SnO_2/Te_{0.4}Se_{0.6}$ Photodetector for Optical Communication and Health Monitoring

Xuemei Lu, Shiji Zhang, Shijie Hao, Shiwei Zou, Haolan Xu, Longji He, Shiwei Zhang, Jie Zhou, Aolin Peng, Gang Liu, Qi Lin, Yongqiang Yu, Guolin Hao

e01783 | First Published: 08 September 2025



Herein, the $Te_{0.4}Se_{0.6}$ film is deposited onto an inverse opal SnO_2 (I-SnO_2) substrate, creating a unique interfacial contact. This innovative structure enhances both the light capture and carrier transport capabilities of the $Te_{0.4}Se_{0.6}$ film. The FTO/I-SnO_2/$Te_{0.4}Se_{0.6}$/Ag device has excellent photoelectric performance, demonstrating its application in the fields of optical communication and health monitoring.

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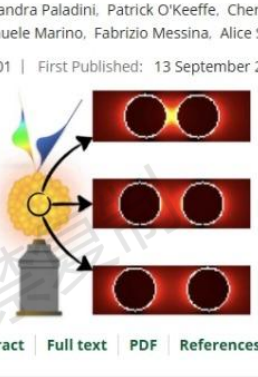
Interparticle Distance Controls Ultrafast Photodynamics in Crystalline Gold Superstructures

Pietro Castronovo, Cristian Gonzalez, Giuseppe Ammirati, Shengsong Yang, Daniele Catone, Alessandra Paladini, Patrick O'Keeffe, Cherie R. Kagan, Christopher B. Murray, Antonio Emanuele, Emanuele Marino, Fabrizio Messina, Alice Sciortino

e02501 | First Published: 13 September 2025



Densely packed, crystalline gold superparticles with tunable interparticle distances are employed as a model system to study the effects of cross-talk between nanoparticles on the ultrafast carrier dynamics via a combination of advanced experimental techniques and numerical simulations. The results pave the way to finely tailorable plasmonic superstructures for disparate applications.

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Modal and Reflective Properties of Capacitive and Inductive Terahertz Metasurfaces

Walter Fuscaldo, Edoardo Negri, Francesco Maita, Luca Maiolo, Romeo Beccherelli, Dimitrios C. Zografopoulos

e01605 | First Published: 29 September 2025

The propagation regimes of inductive and capacitive metasurfaces are analyzed to reveal the existence of leaky and plasmonic modes. The subtle connection between plasmonic modes and quasi bound-in-the-continuum modes is also discussed. Experimental validation is carried out through terahertz time-domain spectroscopy where the frequency shift of leaky resonances is exploited to define a technique for the electromagnetic characterization of metasurfaces.

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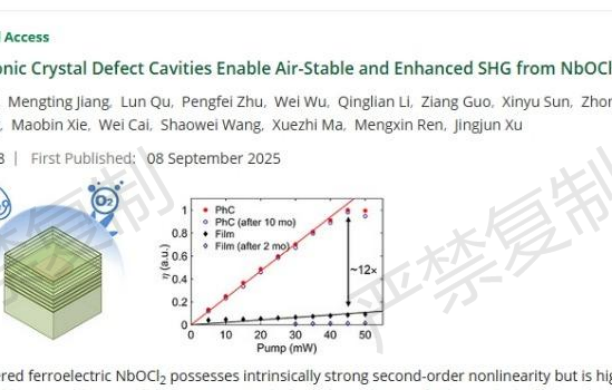
Photonic Crystal Defect Cavities Enable Air-Stable and Enhanced SHG from $NbOCl_2$

Lu Bai, Mengting Jiang, Lun Qu, Pengfei Zhu, Wei Wu, Qinglian Li, Ziang Guo, Xinyu Sun, Zhongshi Huang, Maobin Xie, Wei Cai, Shaowei Wang, Xuezhi Ma, Mengxin Ren, Jingjun Xu

e01588 | First Published: 08 September 2025



Layered ferroelectric $NbOCl_2$ possesses intrinsically strong second-order nonlinearity but is highly sensitive to ambient conditions. Here, a vertical 1D photonic crystal microcavity is designed to simultaneously boost second-harmonic generation (SHG) and ensure long-term material stability. By embedding $NbOCl_2$ between TiO_2/SiO_2 Bragg mirrors, the cavity achieves a 12-fold SHG enhancement via resonant field confinement, while preserving nonlinear functionality for over 10 months. This work demonstrates a practical route for deploying sensitive nonlinear 2D materials in compact and durable photonic architectures.

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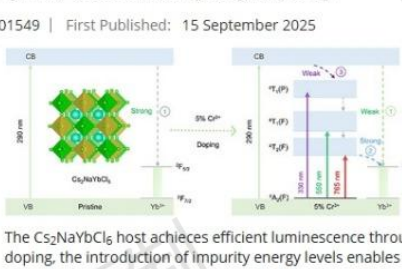
Ultra-Efficient, Broadband-Excitable NIR Emission in Lead-Free $Cs_2NaYbCl_6$ via Cl → Yb Charge Transfer and Cr^{3+} Sensitization

Chunli Zhao, Chengjie Wang, Jia'an Song, Haolan Wang, Zhaoliu Yu, Jiaqi Wang, Zixun Zhao, Xiuling Li, Jinli Liu, Kebin Lin, Zhiming Wang, Arup Neogi

e01549 | First Published: 15 September 2025



The $Cs_2NaYbCl_6$ host achieves efficient luminescence through Cl to Yb charge transfer. Upon Cr^{3+} doping, the introduction of impurity energy levels enables Cr^{3+} to function as a sensitization channel for the characteristic emission of Yb^{3+}, thereby significantly broadening the excitation spectrum of Yb^{3+}.

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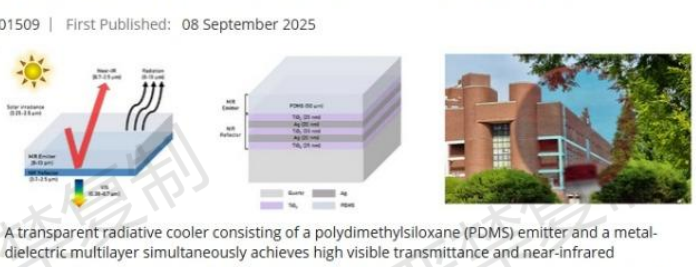
A Multilayer-Based Visibly Transparent Radiative Cooler with Enhanced Solar Selectivity

Juhoon Baek, Minseo Jeong, Doyoon Lee, Huu Lam Phan, Dasol Lee, Minkyung Kim

e01509 | First Published: 08 September 2025



A transparent radiative cooler consisting of a polydimethylsiloxane (PDMS) emitter and a metal-dielectric multilayer simultaneously achieves high visible transmittance and near-infrared reflectance; with a sharp spectral transition near 700 nm. Outdoor measurements demonstrate a temperature reduction of up to 10.8 °C compared to a PDMS-coated glass; highlighting a scalable strategy for energy-efficient; transparent cooling across diverse environmental conditions.

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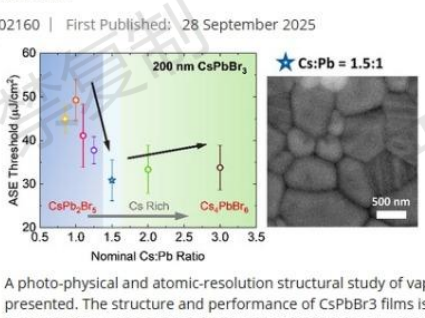
Control Over the Microstructure of Vapor-Deposited $CsPbBr_3$ Enhances Amplified Spontaneous Emission

Qimu Yuan, Weilun Li, Ford M. Wagner, Vincent J.-Y. Lim, Laura M. Herz, Joanne Etheridge, Michael B. Johnston

e02160 | First Published: 28 September 2025



A photo-physical and atomic-resolution structural study of vapor-deposited CsPbBr3 thin films is presented. The structure and performance of CsPbBr3 films is found to be highly sensitive to the precursor flux ratios during deposition. The optimal flux ratio has a small CsBr excess and produced films well-suited for laser applications with excellent microstructures and a reduced amplified spontaneous emission threshold.

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