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Laser-Induced Oxygen Engineering for Localized Homojunction Formation in SnS_2 Photodetectors (Advanced Optical Materials 17/2026)

Jieun Lee, Junil Kim, Young-Jun Sim, Byeongmoon Lee, Jae Eun Jang, Hyuk-Jun Kwon

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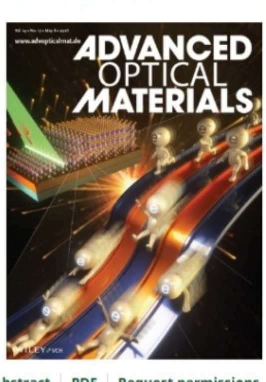

Laser-Tailored SnS_2 Optoelectronics'
Laser irradiation transforms layered SnS_2 into a homojunction with a built-in electric field arising from laser-induced compositional and structural modulation. Photogenerated electrons are rapidly transported across the junction, depicted as carriers sliding along an energy slope, enabling fast photoresponse in SnS_2 optoelectronic devices. More details can be found in the Research Article by Hyuk-Jun Kwon and co-workers (DOI: 10.1002/adom.202503240).

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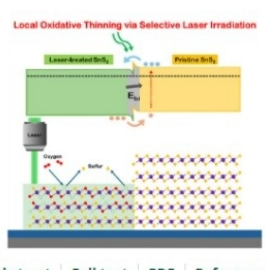
RESEARCH ARTICLE

Laser-Induced Oxygen Engineering for Localized Homojunction Formation in SnS_2 Photodetectors

Jieun Lee, Junil Kim, Young-Jun Sim, Byeongmoon Lee, Jae Eun Jang, Hyuk-Jun Kwon

e03240 | First Published: 11 February 2026

This article relates to:



We pattern the SnO_x region in SnS_2 by direct 532 nm laser irradiation, achieving local oxidative thinning and an in-plane homojunction without stacking steps. A ~0.7 eV work-function difference at the interface creates a built-in field that accelerates carrier separation. The photodetector exhibits millisecond response time and ~2 × 10^{14} Jones detectivity, with excellent cycling stability.

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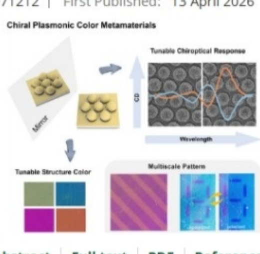
Multiscale Chiral Plasmonic Structural Color Metamaterials With Tunable Chirality and Polarization-Dependent Optical Encryption

Chong Chen, Ningke Xu, Zifan Xiao, Ge Xiao, Yun Jiang, Xiaomi Lu, Gang Zhang

e71212 | First Published: 13 April 2026



Multiscale chiral plasmonic structural color metamaterials are fabricated via a scalable approach combining projection micro-stereolithography and colloidal lithography. The resulting Ag/Au heterostructures exhibit vivid tunable colors and giant chiroptical responses. This platform enables programmable patterning and polarization-encoded color switching, showcasing versatile applications in advanced optical anti-counterfeiting, sensing, and chiroptical devices.

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Degradation of Blue MR-TADF OLEDs: Host-dependent Effects of mCBP and MADN Revealed by Fragmentation Profiling

Min Gyu Jun, Jeong Won Seo, Jong-Am Hong, Kyu-Myung Lee, Yongsup Park, Min Chul Suh

e03852 | First Published: 16 April 2026

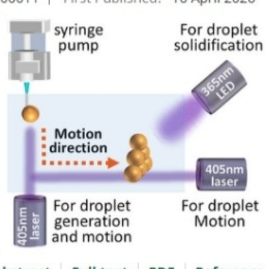
Degradation in blue MR-TADF OLEDs originates from high triplet density caused by slow RISC. LDI-TOF MS directly detects host- and emitter-derived fragments, providing molecular insight into how triplet accumulation drives degradation in the emissive layer.

Abstract | Full text | PDF | References | Request permissions

Underwater 3D Printing Using Dual-Photoresponsive Droplets

Yang Xiao, Hongwang Qiu, Jin Li, Yujie Xiong

e00011 | First Published: 16 April 2026



A photocontrolled, droplet-based, underwater 3D printing system has been developed using dual photo-responsive droplets. These droplets can be generated and manipulated using 405 nm light, and then solidified using 365 nm light underwater. This makes them ideal for printing 3D models such as triangle walls or patches to separate communicating vessels or repair leaks underwater.

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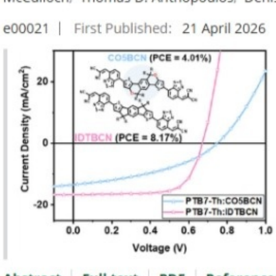
Photophysics and Device Performance of a Pyran-Bridged Pentacyclic A-D-A-Type Non-Fullerene Acceptor (NFA) in Organic Solar Cells

Wejdan Althobaiti, Yakun He, Sandeep Sharma, Julien Gorenflot, Wisnu Tantyo Hadmojo, Filip Aniés, Kun-Han Lin, Maryam Alqurashi, José P. Jurado, Shahidul Alam, Anirudh Sharma, Weimin Zhang, George T. Harrison, Mohammed Bahaziq, Valentina Musteata, Shadi Fatayer, Derya Baran, Iain McCulloch, Thomas D. Anthopoulos, Denis Andrienko, Martin Heeney, Frédéric Laquai

e00021 | First Published: 21 April 2026



Two non-fullerene acceptors, IDTBCN and CO5BCN, exhibit markedly different efficiencies in organic solar cells despite their structural, optical, and electronic similarity. The reasons behind the performance differences are revealed by a combination of optical and electro-optical spectroscopies, thin film morphology and topography studies, and simulation of the devices' JV characteristics.

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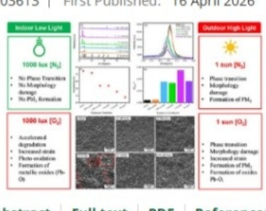
Insights Into Degradation Pathways of Perovskite Thin Films under Outdoor and Indoor Conditions: A Comparative Analysis

Muhammad Bilal, Madsar Hameed, Femi Igbari, Jing Li, Rajveer Singh Rajaura, Richard Whiteley, Guixiang Li, Joe Briscoe, Meng Li, Zhe Li

e03613 | First Published: 16 April 2026



This study compares indoor low-light and outdoor high-light degradation in perovskite thin films. Under ~1000 lux [N_2], films remain stable; in oxygen, the same low light triggers strain, surface oxidation, and shorter lifetimes. Whereas high light accelerates decomposition to PbI_2 and metallic oxides. Findings underline that robust oxygen- and moisture-blocking encapsulation is essential even for indoor devices.

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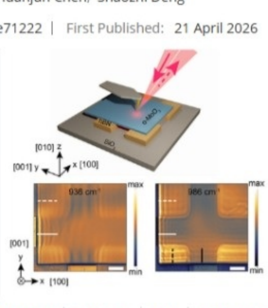
Effect of Substrate Dielectric Properties on Hyperbolic Phonon Polaritons in Van Der Waals α-MoO_3

Wuchao Huang, Fengsheng Sun, Jingyao Jiang, Zebo Zheng, Rui Wang, Hao Wu, Ningsheng Xu, Huanjun Chen, Shaozhi Deng

e71222 | First Published: 21 April 2026



The influence of substrate dielectric properties on α-MoO_3 hyperbolic phonon polaritons (HPhPs) was elucidated through combined theoretical analysis and near-field imaging. In Band 2, suspended α-MoO_3 significantly enhances performance, yielding ~93% longer wavelengths, a 50% increase in propagation length, and a 6% higher figure of merit (FOM), together with improved group velocity (v_g). By contrast, integration with h-BN boosts v_g in Band 3. These results establish a quantitative framework for tailoring HPhP characteristics—including wavevector, loss, and speed—through substrate engineering, thereby advancing tunable, low-loss polaritonic devices.

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Self-Rolled-up Te/Graphene Photothermoelectric Detector Enhanced with Built-in Field for Imaging and Convolution Processing

Mingze Ma, Yaru Shi, Xubing Ye, Tianjun Cai, Ziyu Zhang, Zhiqun Zhang, Zhiyuan Qiao, Jiayang You, Binmin Wu, Xuansheng Pan, Tingqi Wu, Xugao Cui, Tao Sun, Shaojuan Li, Yongfeng Mei, Gaoshan Huang

e71223 | First Published: 21 April 2026

Self-rolled-up Te/Graphene photodetector that utilizes a built-in field at the heterostructure to significantly enhance photothermoelectric response is prepared and demonstrates high responsivity and fast rapid response time. The device leverages wide-angle data to establish self-construct convolution kernels for image processing, establishing a paradigm for in-sensor computing by integrating the material's physical response with computational functions.

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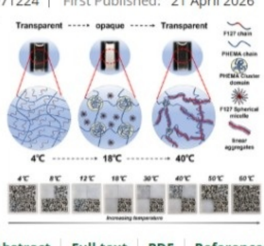
Bidirectional Optical Response Hydrogel Realized by Adjusting Intermolecular Interactions

Junheng Gao, Fu Tang, Likang Zhang, Shuo Li, An Hu, Chuang Yao, Lidong Li

e71224 | First Published: 21 April 2026



An optical response hydrogel featuring a bidirectional transparent-opaque-transparent transition upon heating is successfully developed. The temperature-dependent changes in the hydrophilicity of F127 influenced the microphase separation degree of poly (hydroxyethyl methacrylate) (PHEMA), leading to transparency variation of the hydrogel. This bidirectional optical response behavior enables on-demand writing and temperature-controlled segmented decryption.

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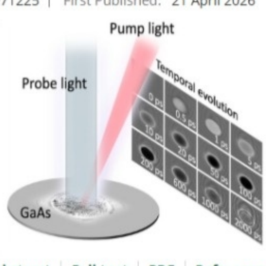
Atomic-Level Smoothness on GaAs via Near-Infrared Femtosecond Single-Pulse Laser Ablation

Siwei Zhang, Shunshuo Cai, Qi Song, Minxia Ding, Zhe Zhang, Yiling Lian, Yu Hou, Haiyan Shi, Kunpeng Zhang, Zichen Zhang

e71225 | First Published: 21 April 2026



This study demonstrates that single-pulse femtosecond laser ablation, leveraging nonlinear absorption, polishes reused GaAs to atomic smoothness (~1 nm) with material removal below 76 nm, as validated by molecular dynamics simulations and high-speed optical imaging.

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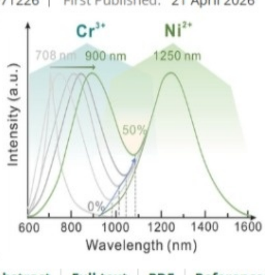
Bridging the Gap Between NIR-I and NIR-II Bands via Efficient Cr^{3+}→Ni^{2+} Energy Transfer in Superstoichiometric MgO·$n$$Ga_2O_3$ (n > 1) Spinels

Jinwei Liu, Jiaxin Li, Guojun Zheng, Chuan Liao, Jianhong Wu, Jianrong Qiu, Wenge Xiao

e71226 | First Published: 21 April 2026



Efficient Cr^{3+}–Ni^{2+} co-doped superstoichiometric MgO·$n$$Ga_2O_3$ spinels enable ultrabroadband NIR emission bridging the NIR-I and NIR-II regions. Enhanced cation inversion induces long-wavelength Cr^{3+} emission at 895 nm and effectively suppresses spectral discontinuity, achieving a state-of-the-art spectral gap height of ~36%, and delivering high photoelectric efficiency of 21% and a maximum output power of 62 mW in compact NIR pc-LEDs.

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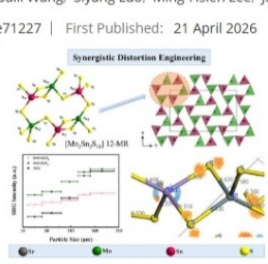
Synergistic Distortion Engineering: Activating Nonlinear Optical Response in Quaternary Chalcogenides via Lattice-Induced [MnS_4] Asymmetry

Guili Wang, Siyang Luo, Ming-Hsien Lee, Jiyong Yao

e71227 | First Published: 21 April 2026



Two new quaternary Mn-based chalcogenides, $SrMnM^{IV}S_4$ (M^{IV} = Ge, Sn), were successfully synthesized via the "synergistic distortion engineering" strategy. They crystallize in the non-centrosymmetric space group *Fdd*2 and exhibit balanced nonlinear optical response realized by latticeinduced [MnS_4] asymmetry.

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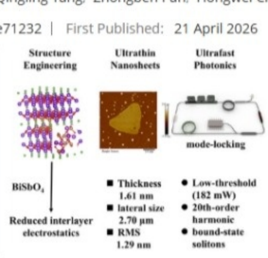
Interface-Engineered Sb-Doped Bi_2O_2Se via Temperature-Mediated By-Product Formation for Efficient Exfoliation and Enhanced Ultrafast Photonic Performance

Qingling Tang, Zhongben Pan, Hongwei Chu, Han Pan, Dechun Li

e71232 | First Published: 21 April 2026



Minor $BiSbO_4$ generated during synthesis subtly reconfigures the interlayer landscape of $Bi_{2-x}Sb_xO_2Se$, enabling the exfoliation of record-breaking, atomically smooth large-area nanosheets. The resulting high-quality layers exhibit markedly reduced saturation intensity, interact strongly with light, drive low-threshold mode-locking, and complex harmonic pulse behaviors, demonstrating an interfacial-modulation pathway for next-generation ultrafast photonic materials.

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Pixelated Laser with Tailored Emission Spectrum Photopatterned by Digital Holographic Microscopy

Sudharsana Bhashyam Pillailokam, Alex Berdin, Arri Priimagi

e71209 | First Published: 16 April 2026

Azobenzene-based surface-relief gratings inscribed via DHM-integrated holographic lithography enable programmable pixelated DFB laser architectures. This approach allows independent control of grating parameters across a 2D array, enabling spatially tailored emission spectra. Single and multiwavelength lasing from pixel arrays are demonstrated, providing a scalable platform for programmable organic laser arrays with applications in spectral encoding and integrated photonics.

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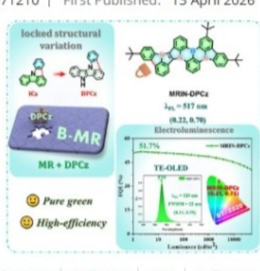
A Novel Locked-Donor-Based MR-TADF Emitter for Highly Efficient and Pure-Green OLEDs

Zhiyuan Chen, Qian Liu, Lai Hu, Chenglong Wu, Ruiqi Chen, Haolin wang, Xudong Cao, Chong Li, Hongjun Zhu, Senqiang Zhu, Rui Liu

e71210 | First Published: 13 April 2026



A novel locked DPCz donor was introduced into MRIN-DPCz, significantly enhancing molecular rigidity and suppressing non-radiative relaxation. This innovation enables an efficient narrowband green emitter, exhibiting a high photoluminescence quantum yield. Sensitized top-emitting OLEDs incorporating this material demonstrate exceptional external quantum efficiencies and color purity, closely aligning with the BT.2020 standard.

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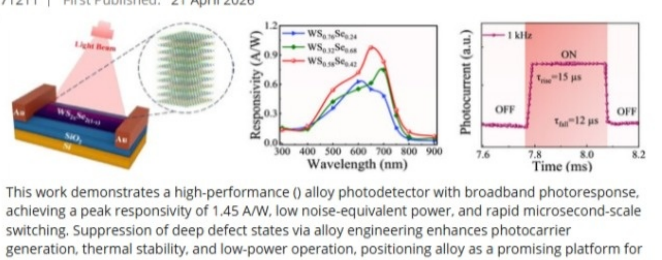
Alloy-Engineered Photodetector for Broadband Fast and Low-Noise Response

Chandani Dubey, Ishrat Bashir, Tanima Lai, Suryakant Singh, Suprovat Ghosh, Sakshi Garg, Rajendra Singh, Supravat Karak, Samaresh Das, Suvadip Masanta, Santanu Manna

e71211 | First Published: 21 April 2026



This work demonstrates a high-performance () alloy photodetector with broadband photoresponse, achieving a peak responsivity of 1.45 A/W, low noise-equivalent power, and rapid microsecond-scale switching. Suppression of deep defect states via alloy engineering enhances photocarrier generation, thermal stability, and low-power operation, positioning alloy as a promising platform for next-generation optoelectronics and sensing technologies.

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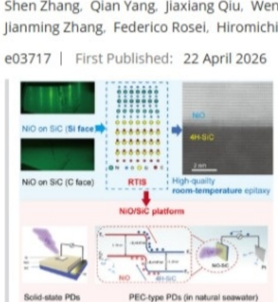
Room-Temperature Interfacial Reactive-Template Epitaxy of NiO/4H-SiC for Dual-Mode UV Photodetection

Shen Zhang, Qian Yang, Jiaxing Qiu, Wentian Zhang, Ahrong Jeong, Yangyang Wan, Shun Li, Jianming Zhang, Federico Rosei, Hiromichi Ohta, Long Zhang, Yuqiao Zhang

e03717 | First Published: 22 April 2026



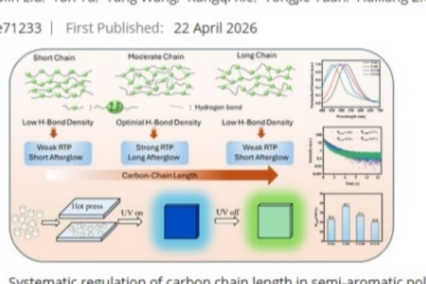
Reactive-template-induced strategy (RTIS) achieves room-temperature epitaxial growth of high-quality NiO on 4H-SiC with atomically flat interfaces and exceptional doping tolerance. This chemistry-driven platform enables switchable solid-state/photoelectrochemical solar-blind ultraviolet (UV) photodetection and is readily extendable to across representative wide-bandgap semiconductors (GaN, AlGaN, ε-Ga_2O_3, and 3C-SiC).

Abstract | Full text | PDF | References | Request permissions

Scalable Semi-Aromatic Polyamides with Carbon-Chain-Regulated and Thermally Stable Cluster-Triggered Room-Temperature Phosphorescence

Min Liu, Yan Yu, Yang Wang, Kangqi Xie, Yongjie Yuan, Hailiang Zhang

e71233 | First Published: 22 April 2026



Systematic regulation of carbon chain length in semi-aromatic polyamides enables efficient, long-lived, and thermally stable RTP by tuning hydrogen-bond content, offering new polymeric materials for advanced anticounterfeiting applications technologies.

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