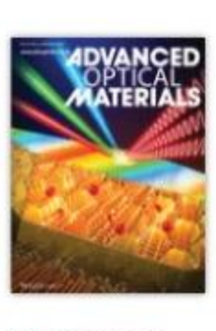
ADVANCED OPTICAL MATERIALS



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Cover Picture

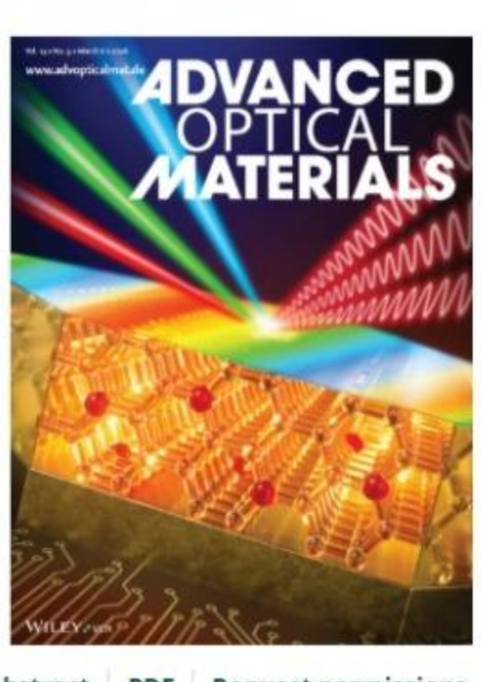
Free Access

Thin Film Interference in Diamond Membranes for Control of Silicon Vacancy Center Emission (Advanced Optical Materials 9/2026)

Deniz Acil, Hengming Li, Maiken H. Mikkelsen

e70995 | First Published: 07 March 2026

This article relates to:



Interference in Diamond Membranes for Brighter Defects
Thin film interference in a wedge-shaped diamond membrane produces thickness-dependent reflection and absorption across the visible spectrum, creating a rainbow-like pattern across the gradient. This optical effect modulates and enhances the emission from embedded silicon vacancy centers by up to 96-fold, offering a route to cavity-free control of solid-state quantum emitters. More details can be found in the Research Article by Maiken H. Mikkelsen and co-workers (DOI: 10.1002/adom.202501609). Art by the team of INMYWORK Studio.

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Inside Front Cover

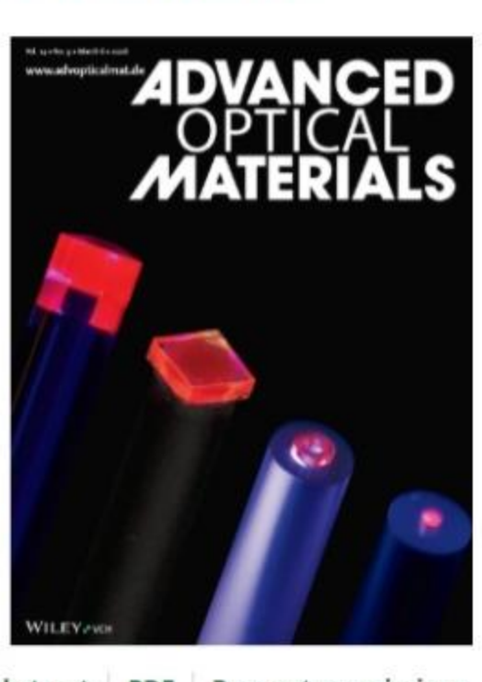
Free Access

3D Microprinting of Structures with Lanthanide-Based Fluorophores on Optical Fibers for Multiplexed Sensing (Advanced Optical Materials 9/2026)

Valese Aslani, Shaghayegh Baghapour, Stephen C. Warren-Smith, Wenqi Zhang, Esmat Ebadati, Sally E. Plush, Alois M. Herkommer, Andrea Toulouse, Shahraam Afshar V.

e70992 | First Published: 07 March 2026

This article relates to:



3D Printing of Luminescent Microstructures
The Cover Picture shows four optical fibers with different luminescent microstructures fabricated directly onto the fiber tips using femtosecond direct laser writing (fs-DLW). Incorporating lanthanide complexes into commercial resists for fs-DLW combines sub-micrometer 3D structuring with the unique photophysical properties of lanthanides, establishing a new versatile platform for multiplexed fiber-based sensing that enables simultaneous detection of biochemical and physical parameters. More details can be found in the Research Article by Valese Aslani, Shahraam Afshar V., and co-workers (DOI: 10.1002/adom.202502989).

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Back Cover

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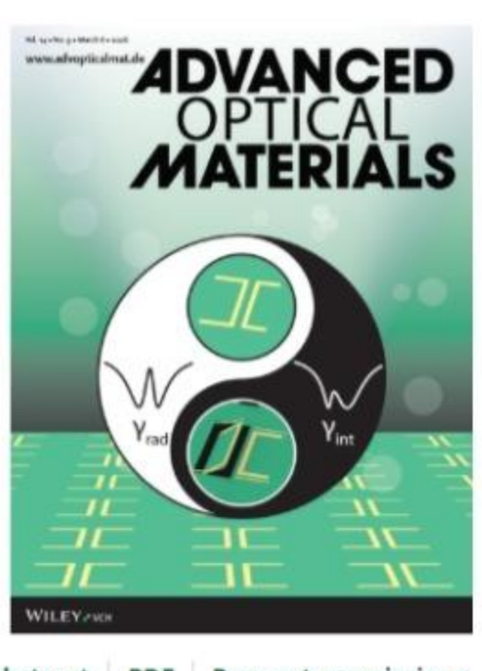
Reconfigurable Quasi-BIC Terahertz Metasurfaces Through MEMS-Induced Symmetry Breaking (Advanced Optical Materials 9/2026)

Zhiwei Yang, Junxiao Zhang, Sylvia Lee, Xiaohang Xie, Richard D. Averitt, Xin Zhang

e70994 | First Published: 07 March 2026

This article relates to:



Reconfigurable Quasi-BIC Terahertz Metasurfaces
The cover image depicts a MEMS-enabled bimaterial cantilever metasurface supporting reconfigurable terahertz quasi–bound states in the continuum (quasi-BICs) via controlled symmetry breaking. In-plane mirror symmetry is broken through lateral resonator asymmetry, while MEMS-actuated cantilever tilting introduces dynamic out-of-plane asymmetry. Together, these mechanisms enable independent control of radiative and intrinsic losses, allowing active tuning of resonance linewidth and quality factor. More details can be found in the Research Article by Richard D. Averitt, Xin Zhang, and co-workers (DOI: 10.1002/adom.202503164).

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Issue Information

Free Access

Issue Information

e70986 | First Published: 07 March 2026

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Research Article

Full Access

High Gain-bandwidth Product MXene-Si-MXene vdW Photodetector for High Signal-to-Noise Ratio NIR Single-Pixel Imaging

Chen Wang, Yunbo Lu, Haolan Xu, Jialu Xu, Xin Wang, Yaqi Zhao, Siyi Xie, Gaobin Xu, Yuanming Ma, Mengchao Ma, Yongqiang Yu

2500441 | First Published: 05 May 2025

The high gain-bandwidth product MXene-Si-MXene vdW photodetector is fabricated by using a synergistic photogating effect. The device exhibits an enhanced photogain of up to 7.2×10^3 and a GBP of up to 1.45 GHz, enabling high-quality NIR single-pixel imaging with 512 × 512 pixels and a high signal-to-noise ratio of 72.3 dB.

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Full Access

Crosstalk-Free Spin-Selective Metasurface for Full-Space Wavefront Manipulation with Nearly 100% Efficiency

Liming Si, Qitao Shen, Ling Dong, Hang Zhang, Chenyang Dang, Xiue Bao, Weiren Zhu

2501041 | First Published: 20 July 2025

This work introduces a spin-selective chiral metasurface that independently controls the phase of transmitted and reflected circularly polarized waves, achieving 97% efficiency and a peak circular dichroism of 0.93 over 10–12.2 GHz (19.8% relative bandwidth). Employing geometric phase rotation exclusively, the design obviates multilayer complexity and paves the way for high-capacity satellite communication systems.

Abstract | Full text | PDF | References | Request permissions

Full Access

Thin Film Interference in Diamond Membranes for Control of Silicon Vacancy Center Emission

Deniz Acil, Hengming Li, Maiken H. Mikkelsen

e01609 | First Published: 23 October 2025

This article relates to:

Thin film interference is a simple yet powerful optical technique to control light. Here, a wedge-shaped diamond membrane that exhibit thickness dependent reflection and absorption in the visible wavelengths is demonstrated. This structure can be used to modulate emission intensity of SiV centers embedded inside the film, leading to photoluminescence enhancement up to 96-fold.

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Development of High-Performance Multilayer Monochromators

Wadwan Singhapong, Arindam Majhi, Wai Jue Tan, Vishal Dhamgaye, Riley Shurvinton, Paresh Pradhan, Igor Dolbnya, Lucia Alianelli, Chris Bowen, Alexander J. G. Lunt, Hongchang Wang, Kawal Sawhney

e01312 | First Published: 07 August 2025

Detailed insights into the optical and multilayer design of Double Multilayer Monochromators (DMM) are presented and fully characterized, including key optimization strategies and solutions to fabrication challenges. By integrating in-house Ion Beam Figuring and a high uniformity multilayer coating process, the developed DMMs achieve high reflectivity, excellent thickness uniformity, and stripe-free X-ray imaging, meeting the requirements of synchrotron applications.

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3D Microprinting of Structures with Lanthanide-Based Fluorophores on Optical Fibers for Multiplexed Sensing

Valese Aslani, Shaghayegh Baghapour, Stephen C. Warren-Smith, Wenqi Zhang, Esmat Ebadati, Sally E. Plush, Alois M. Herkommer, Andrea Toulouse, Shahraam Afshar V.

e02989 | First Published: 21 December 2025

This article relates to:

Incorporating lanthanide-based fluorophores into commercial resists for femtosecond direct laser writing enables a novel platform for multiplexed sensing. Porous, periodic, and solid luminescent microstructures fabricated directly on optical fiber tips are presented. This approach combines sub-micrometer 3D structuring with the unique photophysical properties of lanthanides, enabling compact multiplexed fiber-based sensing and allowing simultaneous detection of distinct biochemical and physical parameters.

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Reconfigurable Quasi-BIC Terahertz Metasurfaces Through MEMS-Induced Symmetry Breaking

Zhiwei Yang, Junxiao Zhang, Sylvia Lee, Xiaohang Xie, Richard D. Averitt, Xin Zhang

e03164 | First Published: 26 December 2025

This article relates to:

Structural and MEMS-induced symmetry breaking enable reconfigurable quasi-BIC terahertz metasurfaces via mode leakage modulation, providing reconfigurable control of high-Q resonances.

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RESEARCH ARTICLE

Full Access

Simultaneous Enhancement of Quinoidal Resonance and Intermolecular Packing Enables Organic Photodetectors with High Detectivity Exceeding 10^{14} Jones below Si Bandgap

Lin Shao, Yijun Huang, Ding Tang, Xudong Qin, Yunhao Cao, Yuang Fu, Xi Luo, Xinhui Lu, Xiye Yang, Sheng Dong, Zengqi Xie, Chunchen Liu, Fei Huang, Yong Cao

e01661 | First Published: 19 February 2026

The synergy of enhanced quinoidal resonance and π-π stacking via a core-extension strategy enables the development of ultra-narrow bandgap NFAs. QXIC-4F based device achieves a high D^* over 10^{14} Jones in self-powered SWIR-OPDs, enabling high-performance flexible PPG sensors and TFT imaging.

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Research Article

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Versatile Gasochromic Hydrogen Detection via Supraparticle-Based Applied Composite Materials

Sarah Wenderoth, Maximilian Oppmann, Daniel Dzoic, Thomas Zimmermann, Mickaël Lejoyeux, Andreas Graff, Benedikt Schug, Susanne Wintzheimer

e03568 | First Published: 28 January 2026

Silica-platinum-resazurin supraparticles are embedded into PMMA to form suprabeads and thin films. The thereby obtained indicators change color from purple to pink to colorless on hydrogen exposure. The indicator systems are tested under various environmental conditions, and their performance is related to their microscopically visualized structure. The work enables scalable, low-cost leak visualization and monitoring in real-world applications.

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RESEARCH ARTICLE

Open Access

Electroluminescence and Franz–Keldysh Modulation Observed in Sn/Ge Multi-Quantum Wells

Michael Oehme, Damiano Marian, Maurice Wanitzek, Christian Spieth, Daniel Schwarz, Florian Bärwolf, Markus Andreas Schubert, Alwin Daus, Michele Virgilio, Giovanni Capellini

e03561 | First Published: 29 January 2026

We investigate the optoelectronic properties of PIN diodes based on ultrathin α-Sn/Ge multiple quantum film structures, fabricated by molecular beam epitaxy, both experimentally and theoretically. The samples exhibit a light emission spectrum in the short-wavelength infrared range with two transitions. Furthermore, when operating as a photodetector, we observe light modulation due to the Franz–Keldysh effect.

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Research Article

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Manipulating Excited-State Intramolecular Proton Transfer (ESIPT) Thermodynamics and Kinetics through Coordination Self-assembly

Peng-Yan Fu, Shao-Zhe Yi, Yu Fang, Mei Pan

e03663 | First Published: 28 January 2026

Suppressing the ESIPT-inhibiting intermolecular proton migration pathway of the monomer, coordination self-assembly creates a rigid framework that provides a strong thermodynamic drive ($\Delta E = -0.29$ eV) and a negligible kinetic barrier ($E_a = 0.01$ eV). This dual enhancement unlocks ultrafast ESIPT for exclusive keto form emission.

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RESEARCH ARTICLE

Full Access

Pressure-Induced Emission Modulation and Retention for Lighting and Anti-Counterfeiting Applications

Jiayi Yang, Shuangchen Lu, Runnan Ye, Cun You, Meiyi Wang, Ming Cong, Pinwen Zhu, Guanjun Xiao, Shunxin Li, Xin He, Jiajia Ning, Yongming Sui, Bo Zou

e03856 | First Published: 30 January 2026

We successfully quenched a blue-white emission in a 0D perovskite $(C_9H_9N_5)_2ZnCl_4{\cdot}2H_2O$ upon decompression, which exhibited a stark increase by a factor of more than 40 and is applied to lighting and anti-counterfeiting.

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Full Access

Leveraging Plasmonic Nanocavity Arrays Forming Metasurfaces to Boost Second Harmonic Generation Due to Surface Effects

Sky Semone, Matthew J. Brandsema, Thang Hoang, Christos Argyropoulos

e02906 | First Published: 30 January 2026

Second harmonic generation (SHG) typically requires non-centrosymmetric crystals to be realized. Here, we experimentally demonstrate a 10^5-fold boost in the SHG response from centrosymmetric materials by realizing gold nanocavity arrays forming plasmonic metasurfaces. The effect is due to the surface nonlinear susceptibility of gold, aided by the significant electric field enhancement that occurs in the nanogaps of the nanocavities.

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Indolocarbazole (ICz)-Centered Expanded Di[7]Helicenes for High-Performance Narrowband Red Emission and Circularly Polarized Luminescence

Meng Qiu, Nai-Te Yao, Xin-Yue Wang, Yun-Jia Shen, Han-Yuan Gong

e03846 | First Published: 11 February 2026

Indolo[3,2,1-jk]carbazole-centered expanded helicenes (**rac-1** and **meso-1**) are developed using single bond-locking and extended aromatic substitution strategies. **Rac-1** exhibits narrowband red fluorescence, strong circularly polarized luminescence, and excellent stability under harsh conditions, outperforming previous analogs.

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High-Performance GA_2PbI_4/PVDF Composite for Energy Harvesting and Real-Time Wireless Photodetection

Prabhat Kumar, Sudipta Das, Nisha Hiralal Makani, Prabhanjan Pradhan, Biplab Kumar Patra, Rupak Banerjee

e03176 | First Published: 16 February 2026

A flexible piezoelectric nanogenerator of 2D organic–inorganic halide perovskite, GA_2PbI_4, loaded PVDF is proposed for energy harvesting via biomechanical movements. When GA_2PbI_4 is added to PVDF, the electroactive phase of the composite increases, indicating the enhanced piezo response. Additionally, the composite demonstrates appreciable photosensitivity under light irradiation, acting as a potential self-powered photodetector.

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Research Article

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Lattice Chirality Prolongs Exciton Spin Depolarization in 2D Perovskites by Enhanced Exciton-Phonon Coupling

Yubo Yang, Wenli Su, Xiaofan Jiang, Pengyu Zhang, Wenkai Zhang

e03363 | First Published: 17 February 2026

The prolonged exciton spin relaxation time can be achieved in chiral perovskites $(R/S\text{-}MBA)_2PbI_4$ compared to their racemic counter part $(Rac\text{-}MBA)_2PbI_4$. This phenomenon can be attributed to the enhanced exciton-phonon coupling leading to dynamic polaronic screening, which slower the spin relaxation process caused by Coulomb interaction.

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Synergistic Control of Valley Polarization and Raman Enhancement via Chiral Plexcitons in WS_2/J-Aggregates Heterostructures

Kun Liang, Chengmao He, Junqiang Li, Dou Li, Li Yu

e01910 | First Published: 17 February 2026

Room-temperature chiral plexcitons are realized in a Au@Ag nanorod/J-aggregates/WS_2 heterocavity on a nanoparticle-on-mirror substrate. Three-mode strong coupling yields double Rabi splittings of 142 and 130 meV, boosting valley polarization to a DCP of 46%. By tuning plasmon-exciton detuning, the same nanocavity provides tunable Raman enhancement (10^4–10^7) via symmetry-broken chiral near fields.

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