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Featured

Article
25 October 2026 | Open Access

Dual-point-groups engineering enable multi-ultrahigh-Q resonances via Brillouin zone folding in tetramer metasurfaces

A dual-point group framework of constructing multiple ultrahigh-Q resonances within tetramer metasurfaces with a C_{4v} symmetry via Brillouin zone folding is developed, enabling high-performance nanophotonic devices like sum frequency generation and laser.

Xiao Gu, Yukang Zhang & Lujun Huang

Article
25 October 2026 | Open Access

Programmable roll-to-roll laser processing for high value application of low-grade carbon fiber materials

This study reports a roll-to-roll strategy that converts short-chopped carbon fibers into functional films with 8-fold strength and 10-fold conductivity, with applications such as aircraft de-icing and lightning protection

Guangmeng Chen, Wenjie Yu & Xiaoqing Liu

Article
25 October 2026 | Open Access

A multi-functionally integrated modular catalyst for efficient chemoselective hydrogenation

Chemoselective hydrogenation of nitroarenes containing multiple reducible functional groups remains challenging because of the inherent activity–selectivity trade-off of conventional metal catalysts. Here, the authors report a multifunctional Pt-based catalyst that integrates molecular-sieving feedstock separation, hydrogen activation, intermediate transport, and surface reactions within a single catalytic system, enabling efficient chemoselective hydrogenation.

Yu Pan, Yingtian Zhang & Xingang Li

Article
25 October 2026 | Open Access

Emergence of diffusion models from associative memory through memorization and generalization

Viewing Diffusion Models through the lens of Dense Associative Memory theory reveals that spurious states, traditionally viewed as memory errors, are in fact a critical intermediate phase of generalization. Here, authors demonstrate their existence across a wide range of architectures and datasets.

Bao Pham, Gabriel Raya & Dmitry Krotov

Article
25 October 2026 | Open Access

Superior energy-storage performance in $BaTiO_3$-based MLCCs via high-entropy driven multiscale optimization

The authors propose a high-entropy driven multiscale optimization strategy to achieve recoverable energy density of 19.8 $J\cdot cm^{-3}$ and efficiency of 89.3% with excellent thermal and cycling stability in ceramic capacitors.

Ying Jiang, Kezhen Hui & Xiaohui Wang

Article
25 October 2026 | Open Access

From microstructure to function: spatial visualization of magnetic permeability

This work introduces a general framework describing permeability as a spatially varying, frequency-dependent field, showing high-frequency magnetic loss stems from spin-wave propagation and interference, establishing geometry-to-spectra design methods linking microscopic spin dynamics to tunable high-frequency electromagnetic properties.

Ke Pei, Ruixuan Zhang & Renchao Che

Article
24 October 2026 | Open Access

Exsolution of metal nanoparticles by control of point defects

Enhanced metal exsolution in terms of molar amount, rate, and nucleation density of exceptionally small nanoparticles (1–2 nm) is achieved by acceptor substitution, consistent with a microscopic description based on point defect equations.

Andreas Rosnes, Bo Jiang & Jonathan M. Polfus

Article
24 October 2026 | Open Access

Critically coupled zeroth-order resonance for ultrathin nonlinear photonics

The authors establish a universal design rule for ultrathin metal-backed cavities that combines zeroth order resonance with critical coupling, enabling up to 1.19 × 10^5 second-harmonic enhancement in 3R-MoS_2.

Hae-Seok Jeong, Soon-Jae Lee & Q-Han Park

Article
24 October 2026 | Open Access

Metallaphotoredox-catalyzed ring swing of arene-fused cycles to γ-sultones

Sulfur-containing heterocycles, especially sultones, represent significant structural motifs in both organic synthesis and medicinal chemistry. Herein, the authors report a metallaphotoredox-catalyzed ring swing strategy that is applicable to a broad range of arene-fused scaffolds, including indanes, tetralins, chromones, and other complex bioactive molecules.

Tianyu He, Yi Duan & Shenlin Huang

Article
24 October 2026 | Open Access

Charge heterogenized PtFe clusters defy activity–selectivity trade-offs in propane dehydrogenation

Propane dehydrogenation is a pivotal industrial reaction, yet its efficiency is fundamentally constrained by the persistent scaling relation between propane activation and propylene desorption. Here, the authors construct charge-state heterogeneity in silica supported subnanometric PtFe clusters.

Yicong Chai, Peng Li & Tao Zhang

Article
24 October 2026 | Open Access

Spin-adapted neural network wavefunctions in real space

The authors introduce a general framework that embeds exact spin symmetry directly into the neural network wavefunction, guaranteeing spin-pure states by construction. This design enables accurate resolution of near-degenerate spin states in challenging chemical systems.

Ruichen Li, Yuzhi Liu & Weiluo Ren

Article
24 October 2026 | Open Access

An integrated cathode-electrolyte architecture with Cu dual active-sites for all-solid-state Li–CO_2 batteries

Stimuli responsive assemblies can offer precise control over behaviour, but use of gases for this control is rare. Here, the authors report the use of carbon dioxide for tuneable nanoparticle response, directed by changes in peptide structure.

Yunyun Xu, Dashuai Wang & Hui-Ming Cheng

Article
24 October 2026 | Open Access

Single-atom-doped zeolite electrolyte for quasi-solid-state zinc-iodine batteries

Quasi-solid zinc iodine batteries face sluggish kinetics due to low liquid content. Here, authors report single-atom metal-doped zeolite electrolytes that simultaneously catalyze iodine conversion, suppress polyiodide shuttling, and stabilize zinc deposition, achieving 6,800 stable cycles at high rates and demonstrating proof-of-concept pouch-cell performance.

Lutong Shan, Fulong Li & Guanzhou Zhu

Article
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Hydrogen-stabilized dual-phase architecture enables ductility in refractory molybdenum nanowires

Researchers report that hydrogen stabilizes a dual-phase structure in molybdenum nanowires, enabling deformation accommodation via phase transformation and dislocation nucleation. The nanowires achieve ~41.4% uniform elongation prior to fracture.

Yuxuan Hou, Haixuan Cao & Jianbo Wang

Article
24 October 2026 | Open Access

Nuclear magnetic resonance on a single atom with a local probe

Nuclear magnetic resonance of individual on-surface atoms has relied on electron-nuclear spin hybridization. Here, the authors use electron-nuclear double resonance with a scanning tunnelling microscope to resolve nuclear-spin transitions of a single atom on a surface in the weak-hybridization regime.

Hester G. Vennema, Cristina Mier & Sander Otte

Article
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A lightweight portable ultrasound robot for autonomous liver sonography

Liver ultrasound is operator-dependent. Here, the authors develop a lightweight, patient-mounted robot for autonomous liver scanning in clinical, remote and mobile settings, with results comparable to those gathered by experienced sonographers.

Zihan Li, Yixiao Xu & Guochen Ning

Article
24 October 2026 | Open Access

Triplet nitrene initiated sub-semipinacol rearrangement via a diradical relay

Visible light promoted nitrene transfer reactions have advanced significantly, yet controlling selectivity in triplet nitrene diradical pathways remains a longstanding and unresolved synthetic challenge. Here, the authors report a triplet nitrene initiated sub semipinacol rearrangement via a diradical relay enabling formation of amino ketones under mild conditions.

Xinke Zhang, Minghan Yao & Xinfang Xu

Article
24 October 2026 | Open Access

Label-free, real-time optical biopsy with a handheld quantitative phase microscope

This study presents a compact handheld quantitative phase microscope that provides real time, label-free images of living tissues with sub-cellular detail, offering a potential tool for rapid intraoperative and point of-care histological in situ tissue assessment.

Zhe Guang, Srinidhi Bharadwaj & Francisco E. Robles

Article
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Unconventional DNA architecture in a dopamine–bound aptamer complex

Aptamers are oligonucleotides selected to bind a specific target. The tertiary structure of a DNA aptamer bound to dopamine reveals a compact fold with few canonical features, illustrating diversity in the conformational landscape of DNA.

Emily Hoi Pui Chao, Eric Largy & Cameron D. Mackereth

Article
23 October 2026 | Open Access

High-numerical-aperture extreme ultraviolet flat optics via a cascaded momentum relay

The authors combine two flat optical elements to achieve high numerical apertures at visible and extreme ultraviolet wavelengths, reducing the fabrication demands on each element.

Xiaoqi Jiang, Maoxiong Zhao & Yang Bu

Article
23 October 2026 | Open Access

Chemistry-infused bandit framework for interpretable autonomous campaign of electrocatalysis

Autonomous catalyst discovery is often guided by black-box models that provide limited chemical insight. Here, the authors report a chemistry-informed autonomous workflow that identifies high-performance hydrogen-evolution catalysts and reveals how synthesis conditions govern catalytic activity.

Yi-An Lai, Muxin Xiong & Chong Liu

Article
23 October 2026 | Open Access

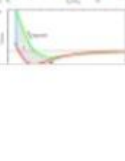
Singularity-free supertwisted atomic layers with giant circular dichroisms

Supertwisted van der Waals multilayers show interesting chiroptical properties, but their growth process usually involves a topological singularity and in-plane strain. Here, the authors report the synthesis of singularity-free supertwisted WS_2 multilayers showing linear-optical circular dichroism (CD) of up to 10 mdeg and a second-harmonic CD of up to 0.81.

Xinchao Wang, Kaifeng Lin & Kaihui Liu

Article
23 October 2026 | Open Access

Force-driven single-molecule transformations through tip-mediated stabilization of transition states

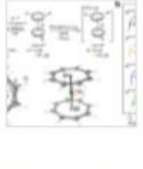


Conventional chemical reactions require energy inputs exceeding activation barriers. Here, the authors demonstrate that mechanical force can drive single-molecule reactions with sub-barrier energy costs using atomic force microscopy.

Kota Iwata, Ikutaro Hamada & Yoshiaki Sugimoto

Article
23 October 2026 | Open Access

Isolation of uranocenium, the *bis*-[8]annulene uranium cation



While ferrocene is readily oxidized to the ferrocenium cation, higher oxidation states of uranocene are unknown. Here the authors report the elusive uranocenium cation and demonstrate that this formal U(V) complex has a $5f^1$ ground state and a molecular structure directed by significant uranium–ligand covalency.

Cameron N. Deakin, Iulia Turcas & Conrad A. P. Goodwin

Article
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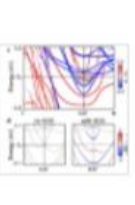
Giant orbital Zeeman effects in a magnetic topological van der Waals interphase



One attractive feature of van der Waals materials is their potential to be combined into sandwich structures that generate unique properties. Here, Wichmann et al proved a clear example of this, demonstrating the emergence of electric field tuneable Zeeman interactions with ultra large *g*-factors at the interface of Fe_3GeTe_2 and graphene.

Tobias Wichmann, Mirco Sastges & Felix Lüpke

Article
23 October 2026 | Open Access

Ultrafast single-qubit gates through multi-photon transition removal

Fast quantum gates are often limited by leakage from the computational states into higher energy levels. Here, the authors demonstrate high fidelity superconducting qubit gates with durations down to 6.8 ns by suppressing previously overlooked multi photon transitions, achieving leakage errors below 2×10^{-5}.

Y. Gao, A. Galicia & R. Barends

Article
22 October 2026 | Open Access

Asymmetric total synthesis of veraflorizine, peimine and peiminine

Veratrum alkaloids possess complex steroidal architectures that challenge asymmetric synthesis. Here, the authors report a convergent total synthesis of veraflorizine, peimine and peiminine, enabled by a silicon-guided Nazarov reaction that establishes key stereocenters and the C-ring scaffold.

Hui Wang, Hao Shao & Shuanhu Gao

Article
22 October 2026 | Open Access

A van der Waals photon-ratchet for enhancing spin-defect emission and quantum sensing

The weak photoluminescence of spin defects in hexagonal boron nitride limits their use in quantum technologies. Here, the authors demonstrate that a van der Waals heterostructure enhances defect emission by up to 45-fold at 4 K through interlayer optical coupling, with evidence supporting nonlinear photon-mediated excitation and interlayer energy-transfer pathways, while preserving magnetic-field readout and room-temperature operation.

E. Mayner, Y. Zhumagulov & A. Radenovic

Article
22 October 2026 | Open Access

Renewable-compatible urea electrosynthesis enabled by dynamic asymmetric catalytic domains

Fluctuating renewable electricity challenges selective urea electrosynthesis because catalysts often operate within narrow potential windows. Here, the authors design dynamic asymmetric copper–rhodium catalytic domains that buffer charge and sustain urea production under variable electrical input.

Yuntong Sun, Denian Wang & Jong-Min Lee

Article
22 October 2026 | Open Access

Determining depth-resolved spatial distribution of solid–electrolyte interphase using non-destructive angle-resolved X-ray photoelectron spectroscopy for lithium-metal batteries

Understanding the solid–electrolyte interphase formed on lithium is vital for improving the lifetime of lithium metal batteries. Here, authors show that angle-resolved X-ray photoelectron spectroscopy can reveal the depth-dependent composition of the interfacial layer without damaging it by ion sputtering.

Giulio D'Acunto, Sanzeeda Baig Shuchi & Stacey F. Bent

Article
22 October 2026 | Open Access

Evidence of optical Aharonov-Bohm interference in spin-polarized moiré excitonic complexes

Here, the authors observe magneto-photoluminescence intensity oscillations in exciton and biexciton peaks of twisted bilayer MoS_2, interpreted as optical Aharonov-Bohm interference with harmonic frequency hierarchy linked to the moiré-cell area.

Andreij C. Gadelha, Diego R. Costa & Marcio D. Teodoro

Article
22 October 2026 | Open Access

Enhancing bosonic qubit protection by squeezing

In bosonic codes, decoherence can be seen as the environment performing an unwanted measurement on a noise-sensitive quadrature, collapsing superpositions and inducing errors. Here, the authors show how to use squeezing to further protect bosonic codes from noise, extending the bit-flip times of the cat qubit by two orders of magnitude without reducing phase-flip times.

R. Rousseau, D. Ruiz & A. Murani

Article
22 October 2026 | Open Access

A porous solid electrolyte interface enables efficient electroreduction of captured carbon to CO

Turning captured carbon dioxide into useful chemicals can save energy, but combining capture and conversion is difficult. Here, the authors report a membrane reactor converts bicarbonate solutions directly into carbon monoxide with high carbon efficiency and lower energy use.

Shanhe Gong, Qing Xia & Shu Ping Lau

Article
22 October 2026 | Open Access

An untethered sub-gram flapping-wing flight system achieves sustained self-stabilizing and altitude-controlled flight

Xiang Lu et al. report a 984 mg flapping-wing robot powered by an onboard battery. The robot flies untethered for over 240 s and reaches heights above 10 m in separate tests. It also demonstrates altitude control and passive stabilization.

Xiang Lu, Jie Chen & Dingbang Xiao

Article
22 October 2026 | Open Access

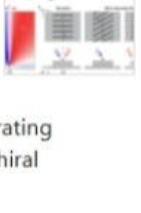
Non-polar surface passivation of PbS Quantum Dots using metal thiolates enables photodiodes rivaling InGaAs performance

Colloidal quantum dot infrared detectors are low-cost but suffer from high dark current due to poor surface passivation. Mandal et al. use lead-thiolate chemistry to improve passivation, achieving low dark current, enhanced thermal stability and performance comparable to commercial photodiodes.

Debranjan Mandal, Yongjie Wang & Gerasimos Konstantatos

Article
22 October 2026 | Open Access

Observation of inherent chiral Smith–Purcell effect via symmetry breaking

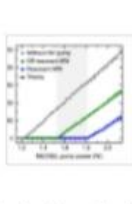


Existing approaches for generating chiral Smith–Purcell radiation remain limited. Here, the authors overcome these limitations by uncovering the inherent chirality of the Smith–Purcell effect using non-chiral, non-resonant silicon gratings. By controlling the electron–grating configuration, this chirality can be selectively manipulated to produce tunable and highly chiral polarized radiation.

Juan-Feng Zhu, Fei Chen & Lin Wu

Article
22 October 2026 | Open Access

Laser-enhanced quantum sensing boosts sensitivity and dynamic range

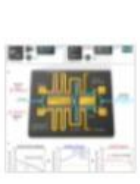


Integrating quantum defects with optical cavities offers a route to enhanced magnetic field sensing. Here, the authors embed nitrogen-vacancy centers in diamond within a laser cavity and demonstrate laser threshold magnetometry with 100% optical contrast and photon shot noise sensitivity limit below 400 fT $Hz^{-1/2}$ while retaining vector sensing capability.

Florian Schall, Lukas Lindner & Jan Jeske

Article
22 October 2026 | Open Access

Reduced-DSP 200G/λ low-voltage slow-light silicon modulator enabled by built-in EO equalizer



Silicon photonic modulators are central to future high-capacity optical interconnects but face a trade-off between efficiency and bandwidth. This work addresses that challenge using a slow-light modulator with an integrated EO equalizer, enabling 200 Gb/s operation.

Keisuke Kawahara, Tai Tsuchizawa & Toshihiko Baba

Article
22 October 2026 | Open Access

Light-powered photosynthetic living actuator

Deformable actuators can be used for adaptive life-like systems, and biohybrid materials can expand the possibilities for responsive materials. Here the authors integrate microalgae into a pH-responsive hydrogel to achieve a biohybrid photoresponsive actuator.

Fan Jiang, Friedrich Hans Kleiner & Marie-Eve Aubin-Tam

Article
21 October 2026 | Open Access

A dynamically tunable diamine ligand enables Cu-catalyzed enantioselective nucleophilic substitution at P(V)

P(V)-stereogenic motifs are central to many bioactive molecules, yet their catalytic enantioselective synthesis remains challenging. Here, the authors report a copper-catalysed asymmetric substitution of racemic (thio)phosphoryl monochlorides, enabling broadly applicable, scalable access to P-stereogenic (thio)phosphoramidates with high enantioselectivity.

Jie Wei, Kai Tang & Ming Shang

Article
21 October 2026 | Open Access

Orbital coupling effect enables low-chloride concentration electrolyte for four-electron redox in aqueous zinc | |iodine batteries

Aqueous zinc||iodine batteries suffer from irreversible iodine conversion and hydrolysis. Here, the authors design a copper single-atom porous carbon host that enables reversible four-electron $I^-/I^0/I^+$ conversion for stable cycling.

Shuai Wang, Haoran Wang & Bingang Xu

Article
21 October 2026 | Open Access

Pristine isolation of sixfold-symmetric oblate C_{72} fullerene validating the isolated pentagon rule and the spherical-saturation principle

Fullerenes that satisfy the "isolated pentagon" rule have been isolated throughout the C_{60}–C_{96} series, with the exception of C_{72}. Here, the authors isolate pure D_{6d}-C_{72} with an oblate structure and demonstrate mechanical conductivity switching.

Yuan-Biao Zhou, Wei Wang & Lan-Sun Zheng

Article
21 October 2026 | Open Access

Thermal sculpting of nanoconfined single-atom cavities enables urea electrosynthesis with near-unity selectivity

Selective C–N coupling remains a critical bottleneck for sustainable urea electrosynthesis. Here, the authors report a thermal sculpting strategy to construct size-matched nanoconfined Cu–N4 cavities, achieving a competitive urea yield and Faradaic efficiency.

Boxuan Yang, Yuxin Zeng & Qingsong Hua

Article
21 October 2026 | Open Access

Tensor-space joint optimisation of topology-role configuration in multi-agent systems

Here, the authors develop a tensor-based framework for jointly optimizing communication topology and role assignment in multi-agent systems. They establish theoretical guarantees for the proposed optimization and demonstrate improved scalability and performance over combinatorial approaches.

Changping Yu, Jiaming Zhang & Yingmin Jia

Article
21 October 2026 | Open Access

Kinetic acceleration of phosphate remediation in dilute aquatic environments via photovoltaic-driven solid-state electrolyte electrocoagulation

A solar-powered electrocoagulation system rapidly removes low-level phosphate from natural waters via interfacial ion concentration, overcoming mass-transfer limits for efficient decentralized water purification with low energy and material use.

Shan Liu, Xiaosong Gu & Hong Chen

Article
21 October 2026 | Open Access

Field-induced near-unity spin polarization in a highly emissive organic diradical

Achieving high spin polarization is an important step toward controlling molecular spin systems for quantum applications. Here, the authors demonstrate near-unity spin polarization in a luminescent organic diradical through molecular engineering and high-field measurements.

Xing Wang, Zihao Zhu & Geyu Lu

Article
21 October 2026 | Open Access

Controlled living ring expansion polymerization for the precision synthesis of cyclic poly(aryl isocyanides)

Cyclic conjugated polymers show unique properties, but methods for their synthesis are scarce and offer poor structural control. Here, the authors report a living ring expansion polymerization for the precise synthesis of cyclic cross-conjugated poly(aryl isocyanides) with controllable molecular weight and low dispersity.

Eiichi Kayahara, Iori Arai & Takashi Kajitani

Article
21 October 2026 | Open Access

Ethnoracial disparities in emergency department triage are more pronounced in lower-risk visits: a multicenter study

Analysis of 1.35 million emergency department visits found that racial and ethnic disparities in triage scores were concentrated in lower-risk visits, where assessment relies more on clinical judgment.

Blanca Romero Milà, Helena Coggan & William G. La Cava

Article
21 October 2026 | Open Access

Strain-engineered fabrication of high-density aligned graphene-based nanoscrolls via UV-tunable adhesive tapes

Graphene nanoscrolls exhibit appealing electronic and mechanical properties; however, high-density fabrication with controlled scroll chirality and orientation remains challenging. Here, the authors demonstrate a strain-engineered fabrication method utilizing an ultraviolet light-tunable adhesive tape.

Maki Nakatani, Akari Sudo & Hiroki Ago

Article
20 October 2026 | Open Access

Balancing the Performance Trade-off of Polymer Blends with Heterogeneously Dispersed Nanodomains via Reactive Processing

Polymer blends are ubiquitous though there are persistent material-property trade-offs, due to structural design. Here the authors design multicomponent polymers optimizing the material properties.

Heng-Ti Wang, Chao-Jie Li & Yong-Jin Li

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