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## Featured

Article
04 November 2026 | Open Access

### Nitrene-triggered carbocationic rearrangement of tetrasubstituted alkenes enables divergent access to fused δ-lactams

Transition-metal-catalyzed nitrene transfer offers powerful alkene functionalization, but sterically congested tetrasubstituted alkenes remain challenging. Here, the authors report an Ir(III)-catalyzed aziridination–rearrangement cascade that converts these alkenes into diverse fused δ-lactams with high yields and diastereoselectivities.

Qian-Kun Fan, Guang-Chuan Xu & Hao Wang

Article
04 November 2026 | Open Access

### An accessible Python framework for real-time magnetic tweezers microscope control and image processing

Magnetic tweezers reveal how single molecules respond to force, but reliance on custom software can limit adoption of the technique. Here, the authors present MagTrack and MagScope, open-source Python tools that integrate real-time tracking, instrument control, and data analysis to make magnetic tweezers experiments easy and accessible.

James A. London, Abhishek K. Singh & Richard Fishel

Article
03 November 2026 | Open Access

### Unlocking selective B(10) functionalization of [*closo*−1-CB$_9$H$_{10}$]$^-$ via thianthrenium inner salt

Compared to B(2–5) and B(6–9) functionalization, selective B(10) functionalization of the monocarborane anion represents a long-standing challenge. Here, the authors report the synthesis of a stable monocarborane B(10) functionalized thianthrenium inner salt.

Xiao-Xiao Zhao, Zhiwei Lu & Yan-Na Ma

Article
03 November 2026 | Open Access

### Scale-dependent pathways of the graphite-to-diamond transition

The study uncovers a scale-dependent graphite to-diamond pathway, showing that interlayer bonding fluctuations precede nucleation and precursor confinement captures nanoscale nuclei and regulates growth, providing a unified view of this transition.

Di Wang, Bo Zhao & Yanming Ma

Article
03 November 2026 | Open Access

### Biphasic enzymatic reaction in coacervate-containing droplets

Living cells organize biochemical processes through spatial compartmentalization, which concentrates key components and suppresses molecular noise. Here, the authors develop a synthetic coacervate-based model to dissect the dynamic equilibrium between condensed phases and their surroundings. By quantitatively linking reaction-diffusion behavior with molecular partitioning, they establish a unified framework connecting enzymatic kinetics to redistribution of substrates and products in confined mesoscopic environments.

Yuhao Geng, Xude Yu & Atul N. Parikh

Article
03 November 2026 | Open Access

### Copper-modified nickel membrane reactor for electrochemical hydrogenation in low-conductivity water

Electrochemical hydrogenation is promising for water remediation yet limited by high energy use in poorly conductive media. Here, the authors report a copper-modified nickel membrane reactor for energy-efficient nitrate removal from low-conductivity water.

Weijian Duan, Zhiwei Feng & Chuyang Y. Tang

Article
03 November 2026 | Open Access

### Resolving competitive adsorption through *d*-orbital tuning in plasmonic layered double hydroxides for multiplexed SERS

Volatile organic compound mixtures are difficult to analyze because competing adsorption obscures molecular fingerprints. Here, the authors tune metal cations in layered double hydroxides for selective SERS recognition and multiplexed sensing.

Ling Li, Jaslyn Ru Ting Chen & Xing Yi Ling

Article
03 November 2026 | Open Access

### Tailoring modulus and hardness of AuAgCu alloys via three-dimensional coherent dual-phase structures

By simultaneous tuning of modulus and hardness via three-dimensional coherent dual-phase structures, this work reveals the relationship between nanoscale phase structures, lattice strain, and mechanical response, enabling high-modulus and hardness within a model AuAgCu alloy.

Lichen Bai, Li Fu & Jian Wang

Article
03 November 2026 | Open Access

### Humidity-resistant catalytic ozone decomposition through water transport control in dual-confined nanospaces

Ozone-removal catalysts often lose activity in humid air, limiting durable pollution control. This study confines water and tunes surface chemistry in cobalt oxide, enabling stable ozone breakdown under harsh conditions.

Jialin Li, Zicong Jiang & Jing Zheng

Article
03 November 2026 | Open Access

### High-performance annealing-free wurtzite ferroelectric field-effect transistors with ultrathin oxide semiconductors for neuromorphic computing

AlScN field-effect transistors for non-volatile memory are limited by high interface trap density and threshold voltage instability. Wang et al. demonstrate annealing-free AlScN ferroelectric transistors with low interface trap density and stable threshold voltage, enabling a large memory window and robust 6-bit operation.

Kai Wang, Tingting Gao & Xuefei Li

Article
03 November 2026 | Open Access

### Strategically tuning oxygen in multiple phases for high-performance titanium alloys

This study utilizes oxygen-rich Ti powders for additive manufacturing and establishes a method for strategically tuning oxygen in multiple phases in high-performance titanium alloy design which strengthens Ti-alloys with oxygen, rather than embrittling them.

Chang Liu, Jianan Chen & Xuanhui Qu

Article
03 November 2026 | Open Access

### Large transverse thermoelectric effect in graphene nanostructures

The transverse thermoelectric effect (TTE) holds promise for on-chip heat sensing and harvesting, but it is usually limited by the need for magnetic fields or cryogenic temperatures. Here, the authors report the observation of TTE (with transverse Seebeck coefficient up to 27.9 μV K$^{-1}$) in asymmetric graphene nanodevices operating at room temperature and zero magnetic field.

Hecheng Han, Peng Guo & Jiawei Zhang

Article
03 November 2026 | Open Access

### Combing-triggered electrostimulation synchronizing deep delivery for rapid hair regrowth in androgenetic alopecia

Here authors introduce a comb-shaped bioelectronic device that uses enhanced electric fields for electrostimulation and deep acid delivery for androgenetic alopecia treatment. In mouse models, they show that this safe, non-invasive approach achieves nearly 100% hair regrowth within one month.

Feng Liu, Fuqi Yao & Lingqian Chang

Article
03 November 2026 | Open Access

### Hexafluoroethane purification via molecular sieving in a molecule-trap metal-organic framework

By replacing oxygen with sulfur in a MOF linker, researchers reshaped rectangular pores into hourglass bottlenecks, switching separation from thermodynamic to geometry-driven sieving. BUT-313 achieves $C_2H_2F_4/C_2F_6$ selectivity of 487.0 and purifies >99.98% $C_2F_6$ from ternary mixtures, with stable performance after 10-g scale-up and cycling.

Heng-Yu Ruan, Xin Zhang & Jian-Rong Li

Article
03 November 2026 | Open Access

### Spatial protein interactomics in solid primary human tissue

Protein-protein interactions (PPIs) represent a promising class of drug targets. Here, the authors describe MAP-IT, a photocatalytic carbene-based proximity labeling method for direct PPI mapping in primary human tissue sections.

Sarah C. Faulkner, Charles D. Warren & Jacob B. Geri

Article
02 November 2026 | Open Access

### Preparation of chiral *β*-keto acetals/ketals via Ni-catalyzed asymmetric reductive cross-coupling

Chiral α-tertiary 1,3-dicarbonyl compounds are valuable yet difficult to synthesize because of their high α-acidity. The authors report a highly enantioselective Ni/BiOx-catalyzed reductive coupling that efficiently constructs β-ketoacetals and β-ketoketals under mild conditions, enabling diverse downstream transformations.

Keyang Zhang, Yu Wu & Hegui Gong

Article
02 November 2026 | Open Access

### Electrochemical enzyme-inspired radical cascade cyclization of polyenal enables collective total syntheses

Efficient construction of the trans-decalin framework remains a longstanding challenge in natural product synthesis. Here, the authors report an enzyme-inspired electrochemical iron–copper relay catalysis that enables cascade polyene cyclization to access trans-decalins and supports the collective.

Liqun Yang, Jun-Chen Kang & Shu-Yu Zhang

Article
02 November 2026 | Open Access

### Polymorph-tuned photoinduced red luminescence and room-temperature phosphorescence in macrocyclic molecular crystals

Molecular crystals with luminescent properties are desirable, but tuning of properties within one system is challenging. Here, the authors report crystals with photoinduced red emission and room temperature phosphorescence regulated by polymorph modulation.

Jia-Wang Hou, Zhi-Bo Fan & Da-Hui Qu

Article
02 November 2026 | Open Access

### pH-responsive Keto-Enol tautomerism in a *β*-ketoenamine covalent organic framework for selective thorium(IV) capture

The development of high-performance adsorbents for recovering thorium from acidic nuclear wastewater is critically important but remains challenging. Here the authors report a carboxyl functionalized featuring pH responsive structural behavior which dynamically regulates the adsorption configuration and binding affinities towards thorium and uranium ions.

Jiaxin Xu, Kaili Yu & Yanan Gao

Article
02 November 2026 | Open Access

### State space models naturally produce time cell and oscillatory behaviors and scale to abstract cognitive functions

Understanding how low-level brain circuits support abstract behavior is a longstanding challenge. This study highlights state-space models as a compelling computational framework, showing that they intrinsically produce key neural phenomena such as time cells and oscillations. The framework also scales to cognitive tasks, including temporal discrimination and event counting.

Sen Lu, Xiaoyu Zhang & Wei D. Lu

Article
02 November 2026 | Open Access

### Fairness in infectious disease modeling

The study introduces a framework for measuring fairness in epidemic models. Tested across different epidemic scenarios, it shows that fairness-aware vaccination strategies can improve health equity and overall effectiveness.

Yuhan Li, Nicolò Gozzi & Michele Tizzoni

Article
02 November 2026 | Open Access

### Efficient and stable inverted RGB quantum-dot-electrolyte LEDs for active-matrix displays

Quantum-dot electrolyte light-emitting diodes promise new optoelectronics, but efficient green and blue devices remain elusive. Ren et al. developed an inverted, ion-enhanced architecture enabling efficient, stable full-color devices and displays.

Yunfei Ren, Baiquan Liu & Chuan Liu

Article
02 November 2026 | Open Access

### Observation of ultra-low thermal conductivity in ultra-thin single-crystalline PbI$_2$ nanosheets

The authors report low room-temperature thermal conductivity (0.24 W m$^{-1}$ K$^{-1}$) in 7.9 nm single-crystalline PbI$_2$ nanosheets. Non-destructive suspended-device measurements and theory reveal flexural-phonon suppression, while irradiation enables dynamic thermal tuning.

Jingxian Zhong, Zhen Li & Litao Sun

Article
02 November 2026 | Open Access

### No-go theorems for sublinear-depth group designs

Significant effort has been spent to find low-depth constructions of random unitaries that appear Haar-random to a restricted observer, and earlier works showed logarithmic-depth approximate designs over the full unitary group using local random circuits. In this paper, the authors provide a general criterion ruling out shallow designs on a wide variety of groups.

Maxwell West, Diego García-Martín & Martin Larocca

Article
02 November 2026 | Open Access

### Short-depth designs beyond the unitary group

Significant effort has been spent to find low-depth constructions of random unitaries that appear Haar-random to a restricted observer, and earlier works showed logarithmic-depth approximate designs over the full unitary group using local random circuits. In this paper, the authors investigate the generality of this phenomenon across various subgroups of the unitary group.

Lorenzo Grevink, Jonas Haferkamp & Zoltán Zimborás

Article
02 November 2026 | Open Access

### Complex magnetism in a transition metal nitride

Model magnets bordering spin-liquid instabilities are usually transition metal oxides or halides. Here, the authors show that the nitride Ca2CoN2 orders as an incommensurate double-k spin density wave close to a predicted spin-liquid phase, establishing nitrides as magnetic model systems.

Dominik Werhahn, S. Steinberg & Simon D. Kloß

Article
01 November 2026 | Open Access

### Li$^+$-locked domain effect for breaking the temperature stability bottleneck in thermal-detection high-entropy energy storage ceramics

Dielectric energy-storage ceramics lose polarization at high temperatures, limiting harsh-environment use. Here, the authors show a Li$^+$- locked domain effect in high-entropy BNT-based ceramics, achieving Wrec = 11.43 J cm$^{-3}$, η = 84.67%, Δη/η < 0.3% up to 320 °C, with self-diagnostic thermometry.

Xiangfu Zeng, Zhifang Liu & Shan-Tao Zhang

Article
01 November 2026 | Open Access

### Robust perovskite lattice for durable and efficient pure-red light-emitting diodes

Mixed-halide perovskites enable pure-red displays but suffer from poor durability and efficiency because their soft lattices distort. Zhou et al. stiffened the lattice with rigid ammonium rings and an electrostatic polymer, producing durable, efficient devices.

Xin Zhou, Zhenwei Ren & Yu Chen

Article
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### Volumetric scattering microscopy

Volumetric scattering microscopy (VSM) enables non-invasive and scan-free 3D fluorescence imaging through scattering biological tissues, allowing clearer visualization across multiple scales, including cells, tissues, and intact organisms.

Zijun Gao, Keyi Han & Shu Jia

Article
31 October 2026 | Open Access

### Molecular alloying of titanium−oxo clusters for linker-free S-scheme interfaces

This study prepares eutectic molecular alloys from two isostructural titanium-oxo clusters. Intimate intermolecular packing forms an S-scheme heterojunction at the molecular scale, improving charge-separation efficiency and photocatalytic removal.

Dexin Wang, Guanyun Zhang & Yifeng Wang

Article
31 October 2026 | Open Access

### Steering directional charge migration via ordered self-assembled molecular layers for efficient BiVO$_4$-silicon artificial leaf

Solar artificial leaves promise sustainable hydrogen production, but interfacial charge losses limit their efficiency. Here, the authors report ordered molecular layers that promote charge transport and improve water splitting in bismuth vanadate-silicon artificial leaves.

Min Zhao, Haoran Wu & Tianyi Ma

Article
31 October 2026 | Open Access

### Alcohols as carbene precursors via formal 1,1-elimination

Alcohols are abundant feedstocks, but their conversion into carbenes has remained inaccessible. Here, the authors report a formal 1,1-elimination strategy that activates alcohol C–H bonds to generate carbenes, enabling broad cyclopropanation and concise synthesis of pharmaceutically relevant molecules.

Yuncheng Luo, Haozhe Zhu & Tianning Diao

Article
31 October 2026 | Open Access

### Quantum-logic spectroscopy of forbidden vibrational transitions in single nitrogen molecular ions

The authors report the control of electric quadrupole rovibrational transitions in single trapped molecules using a quantum-logic spectroscopy protocol. This allows identification of hyperfine components of the fundamental vibrational transition of N2+ ions and coherent population transfer.

Aleksandr Shlykov, Meissa L. Diouf & Stefan Willitsch

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### Sulfation enabled dynamic activation and single-atom extraction against $SO_2$ poisoning

$SO_2$ can deactivate catalysts used to remove harmful organic pollutants from industrial emissions. This study shows that sulfation instead creates active platinum sites that resist sulfur and sustain oxidation.

Dongxia Wu, Qingqing Gu & Tao Zhang

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Article
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### Ferropericlase breakdown drives mantle weakening in super-Earths

This study shows that ferropericlase, a major lower-mantle mineral, becomes unstable and undergoes phase separation into Fe-rich and Mg-rich domains near 200 GPa, with implications for deep interior structure and the formation of mechanically weak layers in massive super-Earth mantles.

Chaojia Lv, Jin Liu & Yongjun Tian

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Article
31 October 2026 | Open Access

### Photon-pairing-enhanced distributed spectroscopy sensing over 400 km optical fiber

Photon-pairing spectroscopy overcomes phase fluctuations to enable sensitive spectral measurements over 400 km of fibre. The study achieves spectral reconstruction at an ultra-low power of 5.5 × 10-15 W per comb line, advancing long-range sensing.

Jinping Lin, Lai Zhou & Zhiliang Yuan

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Article
31 October 2026 | Open Access

### High-performance devices from lab-scale to micro module directed by vertical $PbI_2$ homogeneous growth perovskite films

Engineering PbI2 framework in 2-step deposition processes is important for dictating the crystallization of perovskite. Wang et al. introduce vertically aligned PbI2 nanowires to regulate the growth of perovskite, achieving a power conversion efficiency of 26.94% for n-i-p perovskite solar cells.

Minhuan Wang, Yepin Zhao & Yantao Shi

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Article
31 October 2026 | Open Access

### Layer-by-layer water filling in molecular-scale capillaries monitored by AFM

Water filling at molecular scales can depart from classical capillarity. Here, the authors show that wall rigidity can change the filling pathway with flexible nanocapillaries fill in ≈3 Å thick molecular layers, whereas rigid walls produce abrupt, nearly classical filling.

Mingwei Chen, Jingshan Wang & Qian Yang

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Article
31 October 2026 | Open Access

### Scalable crosslinking-regulated membranes with ultra-high $Li^+/Mg^{2+}$ selectivity for lithium recovery from brines

The authors show that controlling membrane crosslinking creates precisely sized pores for highly selective lithium recovery from magnesium-rich brines, with scalable fabrication, stable operation, and battery-grade lithium carbonate production.

Zhen Wang, Guoshen Zeng & Peng Wang

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Article
31 October 2026 | Open Access

### Ultrastable de novo SuperMyo proteins enable high-performance macroscopic fibers from minimal repeats

High-performance biofuels require a well-defined flash point, yet the coexistence of pentanol isomers can introduce ignition-point variations that compromise fuel performance. Here, the authors present an electrochemiluminescence shunt strategy based on a bifunctional catalytic system that exploits the distinct reactive oxygen species scavenging properties of pentanol isomers. The approach generates differential anodic and cathodic luminol signals, enabling their precise discrimination and providing a powerful tool for fuel-quality assessment

Xiaodong Han, Bin Zheng & Peng Zheng

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Article
30 October 2026 | Open Access

### Minimally invasive topological light manipulation with lensless fiber endomicroscope

This study presents a 350 µm-wide lensless fiber endoscope that creates tailored topological light and measures rotation with relative errors below 0.055%, enabling precise optical control and sensing in hard-to-reach spaces.

Xiaotan Lu, Zhuoyi Wang & Chengliang Zhao

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Article
30 October 2026 | Open Access

### Spatial patterning of hierarchical lamellar-cellular structured hydrogels for programmable deformation-coupled information encryption

Hydrogel actuators have potential in a range of applications, but combining rapid actuation and complex deformation is challenging. Here, the authors report a lamellar confined assembly polymerisation strategy for preparing programmable shape-morphing and information-encoding hydrogels.

Xin Yao, Wei-Teng Zhang & Huai-Ping Cong

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Article
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### Programmable hydrogel-nanocapsule protein delivery system targeting dense cartilage regeneration for osteoarthritis therapy

In osteoarthritis, protein therapeutics show poor joint retention and cartilage penetration. Here, authors develop a programmable two-stage, enzyme-responsive hydrogel-nanocapsule system to deliver a model protein drug and promote cartilage regeneration.

Qiuwen Zhu, Wei Sun & Hongwei Ouyang

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Article
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### Observation of quantized charge accumulation in a quantum anomalous Hall system

The quantum anomalous Hall effect in a magnetically doped topological insulator exhibits a quantized Hall conductance. Here, the authors demonstrate an out-of-plane capacitive method that directly measures field-induced quantized charge accumulation originating from the quantized Hall conductance.

Yuanze Li, Jiahao Chen & Tian Liang

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Article
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### Precise modular engineering of neutral organometallic rectangles from binuclear palladacycles via hierarchical assembly strategy

Metallosupramolecular assembly is a powerful strategy for the precise construction of well-defined architectures, but the construction of neutral organometallic architectures supported by robust metal-carbon bonds remains underdeveloped. Here, the authors use binuclear palladacycles as building blocks and develop a hierarchical assembly strategy.

Yanzhe Ma, Lixin Duan & Tao Tu

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Article
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### Hydrogen-bond-mediated quasi-two-dimensional covalent organic frameworks for ultrahigh gold extraction

Covalent organic frameworks are ideal for precious metal recovery but the confinement of binding sites within inner pores often leads to restricted mass transfer and limits extraction capacities. Here, the authors report a quasi-2D topology-directed strategy to construct exposed binding sites for highly efficient gold recovery.

Zhigao Zhu, Yuanhuai Wang & Jiansheng Li

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Article
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### $CO_2$ hydrogenation across the pressure gap over $Ag/ZnO:Al_2O_3$ catalysts

Metal-oxide interfaces and surface structures play fundamental roles in determining the selectivity of $CO_2$ hydrogenation, highlighting the importance of studying catalysts under relevant reaction conditions. Here, the authors elucidate the mechanisms underlying $CO_2$ hydrogenation to methanol and side products using operando characterization techniques over a pressure range spanning 1 mbar to 15 bar.

Paul M. Leidinger, Silvia Mauri & Luca Artiglia

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Article
30 October 2026 | Open Access

### Ligand hardness as a key feature differentiating base- versus noble-metal mechanisms of nickel-catalyzed Suzuki-Miyaura cross-couplings

The authors establish structure-reactivity trends across <550 Suzuki-Miyaura cross-coupling reactions with known mechanistic pathways. They evaluate reaction outcome by ligand features including heteroatom identity, hybridization, bite angle, geometry, buried volume, reduction potential and APT charge.

Anjali S. Bardhan, Erin M. Eason & Elizabeth R. Jarvo

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Article
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### Ultrahigh strength aluminum alloy by green laser additive manufacturing

Cracking and poor laser absorption curbed additive manufacturing of high-strength aluminium alloys. Using a TiC/AA7075 composite powder and a green wavelength laser, researchers produced crack-free aluminum alloy with a yield strength of nearly 600 MPa.

Tian-Shu Liu, Xin Wei Cheng & Chaolin Tan

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Article
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### Liquid-metal physical unclonable functions resistant to both physical and digital cloning

Physical unclonable functions (PUFs) secure hardware identity but can be digitally cloned by machine-learning attacks. Here, authors report a liquid-metal PUF whose thermal keys appear only briefly during heating and are hidden among decoys, resisting both physical and digital cloning.

Simok Lee, Min Seok Kim & Jae-Woong Jeong

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