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Visible-light-induced oxygen atom transfer into C–Cl bond of aryl chlorides for homolytic cleavage
Oxygen (O) atom transfer (OAT) reaction is a fundamental process in synthetic chemistry, and nucleophilic feature is a familiar one [1, 2]. In contrast, diverse electrophilic and radical oxidants mediate the addition of O atom to nucleophilic substrates [3–5]. Nevertheless, the electrophilic O atom transfer reaction is rarely reported [6–8].
Yong Zhang, Yinfei Niu & Changfeng Ma

Article
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Direct measurement of proximic dipoles reveals the mechanism for like-charge attraction on silica
Like-charge attraction (LCA) is a counterintuitive phenomenon whereby units negatively charged attract one another [1–3]. It has been observed in a wide variety of systems, including colloidal particles [4–6], polyelectrolytes [7–9], and biological molecules [10–12]. Several theories have been proposed to explain the attraction of like-charge particles.
Jack Lukehurst, Andrew Britton & Simon Rudkin

Article
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Multiple-induced pathoborn self-diffusion and surface restructuring on Pd(111)
Surface science is a powerful tool to gain insight into catalytic reactions, but the resulting surface changes toward catalytic operation. Here, the authors show that hydride formation in palladium at low strain energies induces a multiple-step surface restructuring and self-diffusion of Pd atoms.
Tobias Lunkenbein, Felix Girgsdies & Frederik Tee Kiehl

Article
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On-demand sourcing of hyperbolic chiral polaritons
Chirality is a fundamental property of nature, which is ubiquitous in biological molecules, artificial metamaterials and quantum materials [1–3]. Chiral light–matter interaction has been widely exploited to image using refractive biomolecules using visible microscopy.
Wenhao Sun, Guangwei Hu & Cheng-Wei Qiu

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Near-Zero-Cross-Iconic Elastomer for Non-drifting Ear Electroencephalogram Signal Acquisition
Ionotronic encephalography is an emerging technology for brain-computer interfaces. Through this unit, the ionic current in the ionic conductor is converted into the electronic signal in semiconductor, which avoids using Ag/AgCl electrodes.
Ruisheng Liu, Guangfeng Ma & Chi Yan

Article
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Effective dissociation of ultra-high-strength bamboo-stitched fibers via deep-eutectic solvent pretreatment for sustainable composite reinforcement
Bamboo fibers represent a promising biomass-derived reinforcement material but are difficult to isolate due to the presence of lignin and hemicellulose. Here, the authors report a deep eutectic solvent pretreatment that can isolate fibers and preserve cellulose while lignin is removed.
Chang Cai, Jin Zhang & Zhiqiang Zhang

Article
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Two-photon-excited circularly polarized luminescence of lanthanide(III) molecules with multicomponent thermally activated delayed fluorescence
Two-photon excited fluorescence (TPEF) is a powerful luminescence imaging of biomolecules is relevant for the advantages of deep tissue, low scattering signal, and photobleaching [1–3]. Recently, the TPEF of organic activated delayed fluorescence (organic molecules showing strong two-photon absorption, promoted by intramolecular charge transfer) has received increasing attention.
Yu-Jia Hao, Xi-Lin Li & Lorenzo Lunelli

Article
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Polarization dependent angularly selective dielectric reflector
A dielectric mirror that reflects incident light at a particular angle and polarization is described. It consists of a periodic array of dielectric nanoparticles on a substrate. The mirror is designed to reflect light at a single angle and polarization.
Yaoyao Peng, Yi Zhong Liu & Alexander Cogan

Article
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Colossal and fully reversible barocaloric effect for sustainable cooling in a pressure-sensitive salt-crosspool complex
Research is ongoing on the quest to develop a reliable and efficient solid-state refrigerant, which can be used to replace the current vapor-compression technology [1–3]. Barocaloric materials, which undergo a reversible temperature change in response to the application or release of pressure, are a promising and available barocaloric refrigerant.
Yuan Hou, Yuan Zhang & Wen-Hui Wang

Article
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On-demand design of controlled-release systems using an expert mimetic AI framework
Here the authors develop an AI framework called CC-PAT that, starting from a desired release profile, automatically designs controlled-release systems. The framework is experimentally validated and shown to make formulations for controlled-release systems.
Yang Cao, Jiaxiang Zhang & Lei Nie

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Fully-integrated quantum-frequency processor on a silicon chip
Integrated circuit technology has enabled classical information processing to become a ubiquitous deployment-explore infrastructure. Here, the authors demonstrate quantum state generation and manipulation in a single-chip silicon photonic processor.
Mirio Cosmo, Leonardo Ermann & Francesco Scazza

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Optical beam shaping induced reconfigurable magnetic domains
Magnetic domains and domain walls (DWs) have been widely studied due to their potential applications in the form of magnetic DWs. It has been implemented in simple and technologically relevant magnetic structures, such as nanowires and magnetic multilayers [1–3]. Recently, the manipulation of magnetic DWs has received increasing attention by researchers in this field.
Mohammad Shaheen Shadul, Shaowei Li & Hamid R. Rastinehad Nikoo

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Observation of evidence for anisotropic metal-excess ground gallenite
Gallia and related transport theory elements, but their impact on neighboring systems is difficult to observe. Here, the authors report the observation of evidence for anisotropic metal-excess ground gallenite in the transport theory.
Chengle Gao, Cui Wang & Yu Wang

Article
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Stoneche endowed triazine enables rational perovskite ink for scalable flexible perovskite solar cells
Flexible perovskite solar cells (PSCs) are promising for wearable and low-cost photovoltaics. The solution film-grown perovskite is a crucial factor for the efficiency and stability of flexible PSCs [1–3]. However, the solution-processed perovskite film usually suffers from poor crystallinity and inferior interfacial contact [4–6].
Wenhui Zhang, Shuai Wang & Yu Cui

Article
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Direct observation of a spin-polarized surface Dirac gap in the antiferromagnetic topological insulator $MnBi_2Te_4$
Magnetic topological insulators (TIs) have been predicted to host a variety of novel quantum states, such as the quantum anomalous Hall effect [1–3], axion insulator state [4], and topologically obscured magnetic monopole [5]. Among them, the recently discovered intrinsic magnetic TI $MnBi_2Te_4$ has attracted tremendous attention [6–8].
Mohammad Shaheen Shadul, Shaowei Li & Hamid R. Rastinehad Nikoo

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Mohammad Shaheen Shadul, Shaowei Li & Hamid R. Rastinehad Nikoo

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Bonds improve post-mission dispersal compliance and the sustainability of low-Earth orbit
Here the authors show that post-mission disposal compliance can be improved by using bonds to connect debris. The study finds that relatively performant bonds can encourage wide dispersal, reduce long-term debris density, and improve the sustainability of low-Earth orbit by reducing the risk of collisions.
S Kawamoto, F Griffiths & S Bhandari

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Symbiotic heat sharing in MOF based atmospheric water generators for battery thermal management and sorbent regeneration
Here the authors report a symbiotic heat sharing between battery thermal management and MOF atmospheric water generators, making a water-heat regeneration for sorbent, while the sorbent helps battery thermal management in a passive manner.
Wenheng Chen, Mingyan Liu & Yat Hei Ng Nan

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Iterative and data-driven orthobay mining enables reliable discovery of nanomolecular heterotubocarpines
Here the authors report a data-driven approach to discover new molecules and use it to study heterotubocarpines. The approach is iterative and combines machine learning with quantum chemistry and high-throughput experimentation to screen molecules. Challenging, these new systems are shown to be highly active.
Pavel Kolesnyk, Michael Wilkins & Marcus Bruccoleri

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Lipoic dynamic networks break the strength-toughness trade-off in thermoplastic elastomers
Thermoplastic elastomers (TPEs) are widely used in many fields due to their excellent processability and performance of thermoplastic elastomers. Here, the authors address this challenge by incorporating dynamic covalent bonds into the hard domains of polyurethane thermoplastic elastomer via
Hong Zhou, Tianwei Wei & Jiaqiang Hu

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Long-lived giant circular Rydberg atoms at room temperature
The authors report the observation of individually trapped long-lived circular Rydberg atoms at room temperature. Their results open the way to the exploration of a new regime of atom-field interactions and of Rydberg-based technologies.
Sirine Feghhi, Jonathan Kölbl, Jean-Michel Raimond & Florian Schmidt

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Predicting phase transitions across temperature, pressure, and chemical potential using exponentially tilted thermodynamic maps
Thermodynamic maps are the defining characteristic of the statistical mechanical description of molecular materials. Here, the authors develop a generalized framework using tilted thermodynamic maps to predict phase transitions across temperature, pressure, and chemical potential.
Yuanhui Sun, Rocky Wang & Prakash Nagy

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Efficient power generation near room temperature in earth-abundant thermoelectric tin sulfide via entropy engineering
Thermoelectric materials can directly convert heat into electricity and have attracted increasing energy storage parameter, enabling high thermoelectric performance over different energy conversion applications [1–3].
Mohammad Soyel Kabir, Abhishek Bhatt & Kabir Ullah Shah

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Difunctionalization of unsaturated hydrocarbons via EDA complexes to access enolsulfonamidated chromenes
Enolsulfonamidated chromenes are important synthetic intermediates for improving physicochemical properties of drug molecules [1–3]. Here, the authors report a visible-light-induced difunctionalization of unsaturated hydrocarbons to access enolsulfonamidated chromenes via radical cascade reactions.
Wanfeng Zheng, Yuanyang Yang & Anhui Wang

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Studying the failure mechanism in Li-metal electrode by a reversible fluorescence analysis methodology
Understanding Li-electrode failure is challenged by efficient evaluation of solid-electrolyte interphase. Here, authors develop a reversible and quantitative fluorescence analysis method to study the failure mechanism of Li-metal electrodes.
Wen Luo, Hong-Yang Wang & Qing-Wen

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Geometrical metrics resonance photonics
The authors show that the geometrical optical metrics (GOM) framework introduces a novel approach to the interdisciplinary connecting the fractures of nonlinear dynamics, chaos, and photonics. The GOM framework is applied to the theory of fractures describing a diffractive metallic nanostructure.
Chaohao Gan, Hongzhan Fan & Lin Li

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Observation of rich slip behavior with structural superelastic characteristics
The authors report that the dominant slip system with structural superelastic characteristics in a gold-copper-silicon (Au-Cu-Si) alloy, and reveals the slip and transmission path, and finally showed good superelastic properties.
Wenjiang Chen, Yanfei Gao & Zhenghao Gan

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Mineral interposed electrochemical system enabling cathode-selective anodic and active chlorine species generation for urine valorization
A membrane-free electrochemical alkalization and electrooxidation system for urine valorization enables the selective production of hydroxide and hypochlorite, providing a scalable route for urine processing and sustainable fertilizer production.
Yi Liu, Zhengchun Zhao & Yang Liu

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Built-in electric field-boosted atomically Pt^{2+} sensing on carbon-based black phosphorene
Lead-free Pb^{2+} contaminants present a threat to environmental safety and human health [1–3]. Therefore, the development of sensitive and selective sensors for Pb^{2+} detection is of great importance [4–6]. Here, we report a novel sensor based on black phosphorene (BP) for Pb^{2+} with good selectivity against other metal ions.
Wei Yang, Yan Yuan & Yuanyuan Guo

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Metamaterial enabled battery-free wireless soil microbial sensors for unencumbered human-machine interactions
A battery-free wireless soil microbial sensor enabled by metamaterial is reported. It has a miniaturized size, high sensitivity, and unencumbered interaction for environmental science, machine interaction in robotics, VR, and digital twin applications.
Yiming Zhang, Yingguang Fan & Yi Ding

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Tackling chlorine poisoning for robust oxy-ching of PTFE-contaminated plastic streams
Chlorine poisoning is a major challenge in the chemical recycling of polymer and limits recycling. Here, the authors report a novel temperature treatment to clean carbonized surfaces, restoring highly active and stable catalysts for plastic recycling.
Chengzhi Cai, Mingyue Zhu & Zhiming Wang

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Two-dimensional metal oxide polarizers
Polarizers are widely used in optical systems to control the polarization state of light. Here, the authors report the two-dimensional metal oxides such as the layer of tungsten oxide and vanadium oxide. Experiments of the polarizers along with synthesis approaches and future prospects applications.
Yuan Zhang, Zhen Li & Qiaoliang Bao

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Disentangling the effect of space and electric field on photoelectrochemical water splitting
Photoelectrochemical (PEC) water splitting is a promising approach to address open energy issues. Here, the authors report a novel device concept, where the optical absorption of the PEC device and charge layer width and built-in electric field on charge dynamics using in situ time-resolved techniques.
Zhongliang Li, Liqiang Zhang & Yanbing Wang

Article
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A facet retracted back to distinguish amorphous ices
Distinguishing amorphous ice phases has been elusive [1] and only recently [2] did they unveil the existence of two distinct forms of amorphous ice. Here, we report a new amorphous ice phase, which we name the first crystallization shell at the key structural feature distinguishing LDA and VDA.
Valeria Di Pietrogiacomo, Paola Gallo & Emmanuel Mapelli

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Catalytic Asymmetric Spiroannulation to Access Polycyclic Spiro Enones via Transient Axial-to-Point Chirality Induction and Transfer
Chiral spiro polycyclic spiroenones are privileged structural motifs and have been widely used in asymmetric synthesis and drug discovery. Here, the authors report the first catalytic asymmetric synthesis of chiral spiro polycyclic spiroenones via the dearomatization of phenols.
Qian Wang, Ke Chen, Zhong-Ji Jiang & Zhong

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Optical coherent spectra LIDAR chips towards polarization-resolved 4D sensing
Light detection and ranging (LIDAR) with an integrated photonics neural network is reported. Four-dimensional scan data, including 3D spatial and velocity information, is obtained.
Chao Wang, Mi Qiu & Huanfeng Yu

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R.S-induced surface reconstruction enables efficient $CsPbI_3$ QLEDs with extreme red cell
Metal halide perovskite quantum dots are considered efficient, low-cost light-emitting diodes for next-generation displays [1–3]. However, the surface defects of perovskite quantum dots (PQDs) can easily capture charge carriers, decrease their brightness losses, and reduce operational lifetimes.
Wenjing Zhang, Ke Chen & Songbai Li

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Robust bicyclene preparation for entangled photon-pair generation by single-shot Fraunet driving
Entangled photon pairs are a crucial resource in quantum information processing [1–3]. Here, the authors report a robust and efficient method to generate entangled photon pairs using a single-shot Fraunet driving scheme and demonstrate the scheme's robustness against various experimental imperfections.
Jun-Yong Ren, Yan-Ling Li & Yong-Jian Gu

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Thermal conductivity- and optical phonon scattering of CMOS compatible aluminum nitride based ferroelectric thin films
The authors show that boron and scandium precursor scattering in aluminum nitride thermoelectric thin films can be used to tune the thermal conductivity and optical phonon scattering.
Yuanyuan Zhu, Yuanyuan Wang & Yuanyuan Zhu

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Frustrated smectic liquid crystal elastomers as multifunctional mechanical metamaterials
Auxetic liquid crystal elastomers are tunable, soft, and temperature responsive, have the auxetic behavior, and can be used as multifunctional mechanical metamaterials. However, the auxetic behavior is fragility, and the mechanical response of these materials is not well understood.
Jonas Kiesel, Stuart R. Bronte & Heiko K. Bisoyi

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Predictability can be dynamically constructed in deterministic systems
Deterministic systems, even chaotic systems, like orbital wind flow the future completely, yet their future may be unpredictable. Here, we show that the predictability is created by the dynamics. Collective topological structures left in space-time by the dynamics can be used to predict the future.
Carl Hutchinson, Rhys Gao & Ary Kaplan Rot

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Automatic recognition of PICmes in high-resolution mass spectrometry metabolomics samples without relying on the isotope structure
Mass spectrometry detection of PICmetabolites is complex molecule poses a challenge due to interference from isotopic peaks. Here, the authors report a method for automatic recognition of PICmetabolites in mass spectrometry data without relying on isotopic structure detection.
Roland Hollandsworth, Konstantin A. Kozlov & Valentina P. Shkolnikov

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Surface dynamics of glassy polymers with different molecular weight distributions
Polydispersity is the most universal characteristic of polymers but is rarely considered in the study of glass transition. Here, the authors report the surface dynamics of polymers with a narrow molecular weight distribution (MWD) and a broad MWD, and find that the surface dynamics of polymers with a broad molecular weight distribution (MWD) are faster than those with a narrow MWD.
Yanfei Wang, Yongqian Shen & Yu Tian

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Improving coupled cluster theory for strongly correlated molecules with Kohn–Sham density encoding
Predicting the energies of molecules [1] is the central challenge in quantum chemistry. Many-body expansion methods [2–4] are a promising approach to this problem, but they can be slow to converge for strongly correlated systems [5–7].
Alexander Kunitsa, Giovanni Antonio Pagliaro & Ilya Sinitskiy

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Efficient conversion of syngas into sustainable aviation fuel
Abstract: Fossil jet kerosene is predicted to be replaced by alternative jet fuels. Fischer–Tropsch synthesis is a well-established technology to produce synthetic jets. Here, the authors report a direct conversion of syngas into sustainable aviation fuel (SAF) with high selectivity and yield.
Jian Ling, Chengyang Fu & Yuan Kou

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Spin-conserved oxygen redox coupling enables durable anion exchange membrane water electrolysis
Efficient oxygen evolution catalysts are needed for durable anion exchange membrane water electrolysis (AEMWE). Here, the authors report a spin-conserved oxygen redox coupling in a nickel-iron oxyhydroxide catalyst with a low overpotential and stable water electrolysis at high current densities.
Yuanyuan Li, Hongyu Li & Jianhong Liu

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Selective O_2-$^1O_2^*$ oxidation minimizes the carbon footprint of concentrated aromatic remediation via in situ-derived carbon
Here we present a selective oxidation strategy using ozone and sodium percarbonate to transform aromatic pollutants into valuable products. The process operates at ambient temperature and pressure, with efficient biological treatment and lowers the carbon footprint by 90%, utilizing sustainable wastewater resources.
Yi Wu, Shuo Feng & Yun-Hao Zhu

Article
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Mitigating tin loss migration and reinforcing buried interface via renewable polymer-modified tin oxide
Tin-based perovskite solar cells (TPSCs) have emerged as a promising alternative to lead-based perovskite solar cells. However, the poor stability of TPSCs, mainly attributed to the oxidation of tin (II) and the migration of oxidized species, has hindered their commercialization.
Wenjie Ning, Yaqin Chen & Feng Gao

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Co-optimized volumetric muscle design for large dynamic deformations in versatile biohybrid robots
Biohybrid robots [1–3] have been developed to leverage the unique capabilities of biological muscle tissue as actuators [4–6]. However, the limited force output of muscle tissue has restricted the size and payload capacity of biohybrid robots [7–9].
Sean Sebastian, Ellen J. Kamsma & Hamid R. Seyed-Erfani

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