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Self-modulated pH cycle acid sites on FeOCl toward nitrate self-fenton reaction for continuous hydroxyl radicals generation

Designing efficient heterogeneous reactors understanding the pH evolution is the key to the Fenton-like process. Here, a self-modulated pH cycle Fenton reaction is developed by using FeOCl as the catalyst.

Yanqi Gong, Yuxiao Zhou & Zhenghua Zhu

Article

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Multi-modal characterization of nitrate reduction nano-catalysts with metallic site distribution

Understanding the structure-activity relationship of catalysts is challenging. Here, the authors apply four dimensional scanning transmission electron microscopy to map strain in perovskite type catalysts and correlate the strain distribution with performance for nitrate reduction to ammonia.

Xiaoxin Zou, Xingyu Zhang & Ke Fang

Article

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3D printable ultraporous cellulose monolith

Fabrication of cellulose monoliths by the 3D printing technique is challenging. Here, the authors report a 3D printable ultraporous cellulose monolith with a hierarchical porous structure and a high surface area, which is applicable to the fabrication of 3D printable mould materials by getting rid of the traditional printing support.

Zhihan Chen, Hui Wang & Tong Yi Zhang

Article

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Pathway selection between click and aza-Cycloaddition reactions driven by aminosalicylaldehydes

Amino acyclic azomethine ylides (AAAYs) bearing intramolecular aldehyde, alkenyl and hydroxyl substituents undergo cascade cycloaddition/ring-opening/ring-reclosing reaction pathways and deliver structurally diverse polycyclic products. Computational studies reveal the origin of pathway selection governed by the position of hydroxyl group.

Debiprosad Bhattacharjee, Arti Sharma & Chandrasekar G. Rajeev

Article

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A bacterial cell therapeutic nanosupport for multimodal imaging and targeted tumor cell interception in atherosclerosis

Atherosclerosis is a chronic inflammatory disease of arterial vessels. It is hard to detect and treat at an early stage. Here, the authors present a nanosupport that integrates multimodal imaging and targeted therapy to intercept circulating tumor cells and inhibit atherosclerosis in mice.

Jianwei Jiang, Xiaoying Zhang & Lily

Article

17 August 2022 | Open access

Mesoporous ruthenium titanium oxide solid solution with efficient three-phase reaction interface for water electrolysis

Developing active and cost-effective OER catalysts at industrial-level current is essential for efficient hydrogen production. Here, the authors report a mesoporous ruthenium titanium oxide solid solution with three-phase reaction interface for water electrolysis.

Lei Ge, Hong Jiaheng & Ke Fang Qiu Yuan

Article

17 August 2022 | Open access

A bacteria-driven hypoxia-targeting nanoplatform for enhanced MRI-guided tumor theranostics

Bacteria-based systems for solid oxygenation are a promising sustainable method to address global hypoxia in solid tumors. Here, the authors report a bacteria-driven hypoxia-targeting nanoplatform for enhanced tumor hypoxia-activated bioorthogonal nanotheranostic and immune therapy.

Xin Wang, Yanhong Liu & Ting Qi Yuan

Article

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Electrochemically induced hyperfluorescence based on the formation of charge transfer excimers

Hexaaryl-substituted benzenes are of great interest for optoelectronic applications. Here, the authors report the electrochemically induced hyperfluorescence using charge transfer excimers formed by the oxidation of hexaaryl-substituted benzenes and their derivatives as well as a light-emitting electrochemical cell device.

Shengqi Ni Wenxi, Yang Wu & Hellen Y. Sadler

Article

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Amorphous/crystalline interwoven multiwalls with high Co/Ni activity for wide temperature range sodium sulfur batteries

Many active sites inside the encapsulation of solid electrocatalysts are inaccessible. Here, the authors report a multiwalled nanotube with amorphous/crystalline interwoven multiwalls for high-performance conversion-enabling high-capacity and long-life lithium/sodium sulfur batteries.

Yongjun Chen, Chen Yang & Wei Zhou

Article

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Geometry-entrainment self-switching in organo-hydrogels for autonomous mechanics and adaptive sensing

Self-oscillating gels can convert chemical energy into mechanical motion, enabling autonomous mechanical processes. Here the authors design a geometry-programmed self-switching strategy for organo-hydrogels to achieve autonomous mechanics and adaptive sensing.

Chaofan Xu, Yang Yang & Yuhe Zhai

Article

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Abrasion-resistant wearable skins based on bilayered solid/liquid stretchable conductors

Wearable electronics require stretchable conductors with abrasion resistance. Here we report that the reversibly and abrasion-resistant performance of these skin. This study presents a bilayered stretchable conductor with a solid/liquid configuration that combines abrasion resistance, stretchability and conductivity.

Dajun Wang, Peiyuan Shi & Wenlong Cheng

Article

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Elucidating the rate-limiting step of CO2 electroreduction on metal-nitrogen-carbons

Metal-nitrogen-carbons are promising electrocatalysts for CO2 conversion, but the rate-limiting step remains unclear. Here, the authors report a universal descriptor for the rate-limiting step for CO production in metal-nitrogen-carbons and its CO2 utilization in membrane apparatus.

Zhuangzhi Han, Jiajun Shi & Xuefeng Feng

Article

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Carbon defects as active site elevation to unwind Co-O_x enables stable chlorine evolution in acidic media

Acidic chlorine evolution reaction (CER) is a promising alternative to water oxidation in acidic media. Here, the authors report a carbon-supported cobalt oxide catalyst with carbon defects as active sites for efficient and stable acidic CER, achieving high activity and long-term stability.

Zhiwen Chen, Ming Zhang & Lingzhi Zhang

Article

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Simulating the Photochemical Birth of the Hydrated Electron in Liquid Water

Here, we simulate the hydrated electron chemistry behind hydrated electron formation in ice-cooled water. The simulations reveal a flashing hydrogen bond network where hydrogen bonds are not forming pathways.

Dominik Van Hoesel, Gisela Wallacz & Ali Hassanali

Article

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Dual coordination of thermodynamics and kinetics in covalent organic frameworks for separation

Chromatography is dependent on a combination of thermodynamic and kinetics, but engineering both factors in one material is challenging. Here, the authors report a covalent organic framework that can tune both thermodynamics and kinetics perspectives for chromatographic separation of halogenated hydrocarbons.

Qi Sun, Hui Shi & Yan-Ling Qiao

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Ultra-efficient physical field computation by r-complex valued network quantization

The study presents a physics-based method to compress complex-valued neural networks. It demonstrates the method's effectiveness in optical computing and electromagnetic inverse scattering, and verifies it through numerical experiments.

Yuhang Li, Shiqi Gao & Aydogan Ozcan

Article

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Probing boron vacancy defects in hBN via single-spin enhancement

Accurate characterization of emerging quantum sensors requires an imaging technique that does not perturb the sensor's properties. Here, the authors report a non-invasive, super-resolution method that uses single-boron-vacancy defects in hBN as spin sensor ensembles, enabling quantitative nanoscale imaging of magnetic fields and temperature gradients.

Alex J. Ziffer[...], Nicholas Dontschuk & Jean-Philippe

Article

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In situ synchrotron X-ray scattering reveals organic-mediated scaling mechanisms on desalination membranes

Scaling is a major challenge in membrane desalination. Here, the authors use a combination of X-ray scattering techniques to probe scaling under water desalination and crystallization conditions.

Zhenlong Yang, Yao Lu & Yongjie Lin

Article

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Chirality transfer from chiral microvortex to molecular dopants via charge transfer states

Chiral microvortex is a promising flowing chirality from that generated mechanically to stimulate chiral molecules. Here, the authors report the chirality transfer from the microvortex to the excited state, identifying critical criteria the chiroptical properties of the host matrix, resulting in selectivity to circularly polarized light.

Xuan Liu, Lihua Yuanhua Tian & Weiyu Hou

Article

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Salvating magnesium polysulfides enables low- barrier speciation for magnesium-sulfur batteries

Magnesium-sulfur batteries promise high energy density but the low kinetic, slow, and to-date irreversible sulfur redox chemistry has severely prevented their practical application. Here, we report a

Wenxi Li, Weiwei Zhao & Yuanyuan Wang

Article

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Wafer scale manufacturing of ultra-broadband, high-power erbium-doped integrated lasers

Silicon-based fiber lasers are widely used but hard to integrate on chip at an industrial scale. Here, the authors report a wafer-scale process to fabricate erbium-doped lasers with ultra-broad tuning and ultra-narrow linewidth, and their laser noise behavior.

Henry J. Kuo, Yang Yi Chow & Vahid Sorianezhad

Article

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Synthetic data-driven deep learning for label-free autonomous atomic force microscopy

This study introduces SimuScan, a synthetic data-driven deep learning framework that enables autonomous atomic force microscopy without manual intervention, accelerating nanoscale characterization.

Ruben Vidal Schuster, Vivek Chavan & Leo Kobler

Article

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Broadband multi-beam lens assisted omnidirectional-enabling multi-gigabit backscatter data-capacity for next-generation wireless networks

The internet of everything is seen across tremendous wave identification system that sensors multi-gigabit communication. Here, we report a broadband multi-beam lens assisted omnidirectional backscatter wireless enable multi-beam modulation, achieving 4 Gbps at 4 m and 1 Gbps at 10 m, offering an energy efficiency of 0.25 nJ/bit and a data rate density of 1.

Shaoxin Gong, Chenglong Liu & Jian Wang

Article

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High-speed Si Ge avalanche photodiode with a gain bandwidth product of 756 GHz

The authors showcase a lateral Si-Ge avalanche photodiodes in the C-band. With low dark current, high gain-bandwidth product and high saturation power, this device is a promising candidate for high-speed Si photonic receivers.

Yimin Chen, Chao Zhang & Jia-Min Wang

Article

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Reversible H2 storage at moderate temperatures by a trilayered lithium borohydride nanocomposite

Lithium borohydride is a promising hydrogen storage but limited by high kinetic barriers. Here, a triphase/layered nanocomposite of LiBH4 with MgH2 and TiH2 is reported with reversible H2 storage energy. It is a high reversible storage capacity under moderate conditions.

Wenxuan Zhang, Hui Zhang & Xuegian Fan

Article

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Anisotropic shape heterogenized HF-2 solute crystals enabling barrier-free carrier injection in 2D HPs-conducting channels

The fabrication of three crystals for 2D transistors remains challenging. Here, the authors report the HF-2 solute crystals with anisotropic shape heterogenization to enable barrier-free transport through chemical 2D HPs. Substrates with solution epitaxies down to 4°C (ref).

Zhiyuan Chen, Yanfu Gong & Dongbo Liao

Article

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Ferroic-based transport beyond the upper critical field in superconducting La3Ni2O7-δ thin films

Here, we report the observation of ferroic-based transport in thin films under pulsed magnetic fields up to 60 T to explore the superconductivity. The first finds the normal state is highly demodulated flow liquid.

Yu Zhe Han, Yang Liu & Yanwei Cao

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Textured electrolytic ceramics with reduced grain size for high-frequency transducer applications

The lack of piezoelectric ceramics in thickness-mode transducers operated in ultrasonic with grain sizes of 1 μm, enabling to harness high piezoelectric and dielectric properties of textured ceramics at high frequencies.

Yuhua Chen, Zhuo Xu & Xi Yao

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Towards universal multi-dimensional quantification of nanomechanical properties in direct-diverse fiber 3D-2Dm-hybrid innovations

This work enables seamless fiber-to-fiber and fiber-to-chip nodes field connectivity and establishes a universal platform for high-performance multi-dimensional fiber-based for next-generation high-capacity data transmission and reconfiguration.

Hang Li, Changhyun Cui & Jian Wang

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Covalent warhead assembly in fluoricin biosynthesis involves polyketoreduction facemediated by a diflavin oxidoreductase and enzymatic demalonylation

A conserved α/β-hydrolase domain protein and an flavoprotein are the polyketoreductase and enzymatic demalonylating enzyme activity, in the biosynthesis of the unusual fluoro-α,β-enoyl thioester warhead of fluoricin. Structural and biochemical studies reveal the molecular basis for the unusual polyketoreduction and demalonylation reactions.

Lisa N. N. T. Nguyen, Louis Schlüter & Yuzhi Hahn

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Dynamic stabilization of a mechanical oscillator in the absence of any stable feature

This study demonstrates dynamic stabilization of a mechanical oscillator existing between two unstable states using only time-dependent stiffness and damping. It provides theoretical and experimental evidence of dynamic stability without any stable mean or damping.

David Haberg, Nalin Celik & Vassilios Ferfolia

Article

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Synthetic dimensions for communication

Synthetic dimensions in optical systems have been proposed as a new degree of freedom for multiplexing, but their practical implementation remains challenging. Here, the authors demonstrate a synthetic dimension platform for communication and computing.

Avik Dutt, Yiwen Wang & Shanhui Fan

Article

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Polyphenol-mediated zinc oxygen-synergistic hydrogel remodels senescent microenvironment for periodontal tissue regeneration

Periodontitis is a chronic inflammatory disease with a high incidence. Here, the authors develop a multifunctional hydrogel that alleviates hypoxia and does cell aging, and restores microbial homeostasis to promote periodontal tissue regeneration.

Chengcheng Yu, Yu Liu & Shaohong Fan

Article

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Simple omphacosol residue saturation perturbations regulate global protein architectures and function

An engineering simple residue of protein with a light-switchable molecule, this study reveals that local protein structure perturbations can be propagated to allosterically regulate protein function and activity, offering the prototype to de-immune functions. Omphacosol.

Yingxue Liu, Meng Wei & Bo Li

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Dynamic hydrocyclic cycle of zeolite for sheet and nitro sheet chain PTA3 for metallic water

wood the global PTA3 nitro-bridging Latin sheet chain congeners, researchers develop a nitro-bridging PTA3 sheet chain zeolite for metallic water. The zeolite absorption regeneration cycles, enabling sustainable water purification applications.

Yuanji Shi, Mingfeng Yang & Xiangqiang Pan

Article

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Carboxylation of waste polyesters into high value organic acids

Current plastic recycling is often limited by high energy costs and low value outputs. This study presents a catalytic process for upcycling waste polyesters into high value organic acids.

Dongyu Xu, Sheng Zhu & Qingqing Ma

Article

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Solar nanoreactors via novel MoPS₃ nanocrystal for high performance thick film organic solar cells

Thick film organic solar cells are important for large area printing and roll-to-roll processing. Here, the authors present an efficient and stable photocatalytic nanocrystal for thick film organic solar cells, which can be used as a solar nanoreactor to enhance photocatalytic activity.

Zhanyu Li, Miao Yu & Haidan Lei

Article

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Transcranial focused ultrasound induces sparse localizable cortical activation in resting state humans and modulates connectivity with transcranial electrical stimulation

The effects of transcranial focused ultrasound (tFUS) on the human brain network are poorly understood. Here, the authors show that tFUS can induce sparse cortical activation and modulate brain connectivity when stimulation and its quantitatively neuromodulation of the resting state human brain.

Joshua Kosnoff, Yuhao Guo[...] & Bin He

Article

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Learning turbulent flows with generative models for super-resolution and sparse flow reconstruction

Turbulent flow reconstruction is a significant challenge due to the computational expense and difficulty in accurately capturing the small scale structures. This work introduces an approach to super-resolve turbulent flow fields from sparse observations using generative models. The approach is applied to experimental measurements in water towed grid super-resolution. Forecasting, and sparse flow reconstruction of turbulent flow fields from sparse observations using generative models.

Kai Fukami, Kunihiko Taira & Kengo Fukami

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Orbital selective band engineering realizes high ZT in p-type Bi2Te3–Sb2Te3 bulk thermoelectrics

Authors discover a class of p-type thermoelectric full vacuum compounds and show that by orbital selective band engineering, the electronic structure can be tuned to change valence band, yielding a high ZT value at room temperature.

Yuanyuan Gu, Yu Liu[...] & Ce-Wen Nan

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Kibble–Zurek mechanism and beyond in a holographic superfluid disk

The Kibble–Zurek mechanism (KZM) describes universal scaling laws in the dynamics across a continuous or second-order phase transition. Here, the authors study the KZM in a holographic superfluid disk model and beyond it.

Chuan-Yin Xia, Hai-Qi Zhang & Jiliang Jing

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Moisture-tolerant Mg-metal electrodes for practical fabrication of rechargeable Mg batteries

Mg batteries are promising candidates for safe, low-cost, and eco-friendly rechargeable energy storage devices. Here, the authors report a Mg-metal electrode that is moisture-tolerant and enables the fabrication of Mg batteries under humid air conditions.

Wenxi Liu, Chenglong Liu & Yanliang Liang

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Modulating ZrO2 electron transfer via engineered ultra-thin TiO2–Al2O3 interfaces for color-resistant methane dry reforming

Ultra-thin interfaces of TiO2 on Al2O3 are fabricated via atomic layer deposition to modulate the electron transfer between Ni and the support. The resulting catalyst exhibits high activity and stability in methane dry reforming due to the formation of Ni-O-Ti bonds that facilitate electron properties, ensuring exceptional color resistance and long-term stability at high temperatures.

Shanshan Chen, Li Wang & Xiaobo Liu

Article

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Perovskite solar cells with enhanced thermal fatigue resistance under extreme temperature cycling

Perovskite solar cells are susceptible to thermal fatigue under extreme temperature cycling. Here, the authors report a thermal fatigue resistant strategy to enhance the performance and durability of perovskite solar cells. Reinforcing interfaces and degradation of perovskite solar cells. Reinforcing interfaces and modulating the crystallization kinetics can yield unprecedented stable high efficiency solar cells.

Qian Wang, Jin Xiuhai & Chen Jiaxin

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Nitrogene Fraction is a non-equilibrium spatially-distributed electric field

The authors report a non-equilibrium spatially distributed electric field strategy for 2-nitrogen fraction in proteins in plasma.

Peiyuan Sun, Yuan Wang & Hao Zhao

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Getting robots back on track by reconstituting control in unexpected situations with online learning

Robots struggle to operate under unexpected situational circumstances. The authors introduce fast learning, online control algorithm that can help robots, leveraging their repertoire of pre-trained skills, overcoming various diverse conditions.

Charles Sullivan, Marcus Tiegue & Jivkova Sully

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Nonequilibrium ordering dynamics of confined self-alignment hydrogel colloids driven by time-evolving attractive interactions

Governing the evolution of non-equilibrium orders remains a challenge. Here, the authors show that time-evolving attractive interactions can direct the colloidal gels through the self-organization into ordered, hexagonally ordered lattices.

Ki Hyeon Jung, Chelsea S. Rosenblatt & Kevin Jun Lee

Article

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Sequential photonic ultrawideband real-time spectrum sensing for 6G wireless networks

Real-time spectrum sensing (RTSS) is essential for the networks to recognize and avoid interfering and congested channels during wireless communication. Here, the authors develop a chip-free photonic RTSS system with ultrawideband, high-resolution, and high-speed capabilities for 6G networks.

Xiaoxiaoling Yao, Junfeng Fang & Yitang Dai

Article

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Reconstructing end-of-life membranes for enhanced sustainability and unprecedented performance

Membrane technology is a promising solution for water and energy sustainability. Here the authors engineered GO membranes via dissolution-to-organic solvents followed by re-casting, achieving unprecedented performance and stability.

Chaoyue Yao, Jun-Jun Liu & Zhiwei Wang

Article

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Unveiling the thermodynamic kinetic trade-off effect on acid sites in zeolite-catalyzed alcohol dehydration

Identifying how different acid sites function in zeolite catalysts is essential yet difficult as their properties are intertwined. Here, the authors report a universal descriptor and how they think of their properties.

Yuanshuai Liu, Yuchao Chai & Yong Wang

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Superior resilience to nonlosing and amenability to enhancing in quantum-machine learning

This study demonstrates that quantum machine learning models exhibit inherent resistance to data corruption and can be enhanced by efficient unlearning, proposed for secure and trustworthy

Yu-Wei Zhao & Jin-Fei Zhang

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Methane epoxidation to oxygenates is a long-pursued dream in the fields of chemistry and catalysis. The study puts a copper-based hexane dioxide photocatalyst to date bond breaking, yielding methanol and ethanol.
Chunyang Zhang, Yi Lang & Jie Liangzhi Zhang

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Compact mid-infrared fiber probe for in vivo multi-compound monitoring demonstrated using ex vivo brain slices
The study describes a 7.3 mm diameter mid-infrared fiber-optic probe, the smallest reported to date, which can be used to monitor multiple different glucose and lactate, with attention to in vivo studies and will contribute to microdialysis.
Yan Jing Lan & Sanjin Hanrahan

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Reconstructing fine-scale 3D wind fields with terrain-informed machine learning
This study presents a terrain-aware framework trained on computational fluid dynamics that reconstructs fine-scale 3D wind fields from coarse observations, enabling accurate and computationally scalable terrain-aware wind resource assessment.
Chenwei Lin, Xuan Tie & Hao Li

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Bioorthogonal bacteria-based liposome-targeting chimera platform for tumor-targeted therapy
Here, we report a bacteria-based liposome-targeting chimera system by integrating pathogen-associated proteins, for example, a flow cytometry, that can be used to target liposomes to tumor cells. The bacteria-based liposome-targeting chimera system can be used to target liposomes to tumor cells. The bacteria-based liposome-targeting chimera system can be used to target liposomes to tumor cells.
Zhiyue Zhang, Yuhang Li & Qiuling Tian

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Massive-scale spatial multiplexing of multimode VCSELs with a 3D vertical-photonic lantern
This work demonstrates a 3D printed photonic lantern that efficiently combines many multimode VCSELs into a single fiber, enabling massive spatial multiplexing and providing a compact, scalable high-power source for sensing.
Yuxi Zhang, Hanlue Zhuldina & Dan M. Marcos

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High-voltage and stable ex-free LiNiO2 positive electrode for sulfide-based all-solid-state batteries
High-voltage (≥ than LiCO3) positive electrode for all-solid-state batteries suffers from structural and interfacial instability. Here, we report a surface coating strategy that stabilizes the cathode and enables durable, high-rate all-solid-state batteries.
Yue Wang, Qiang Yi & Xin Zhang Gao

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Frequency division routing via spin- refractive index locking
This study demonstrates spin-refractive index locking in a microwave metamaterial, enabling frequency-division routing of electromagnetic waves. The fundamental effect is also demonstrated and could find practical applications in sensing.
Yuan Dong Hong, Jin Hao Jay Ai & Yihe Wang

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Liquid engineering tubes hydrophobic microenvironments for efficient electrocatalytic oxidation of fatty alcohol
Electrocatalytic oxidation of fatty alcohols in aqueous media is limited by mass transport due to their poor solubility. Here, we report a hydrophobic microenvironment strategy to enhance electrocatalytic oxidation of fatty alcohols by boosting reactants.
Rudy Xu, Zeshan Chen & Yi Cheng

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Electric double layer structure in concentrated aqueous solution
Here, we report the structure of the electric double layer at practical concentrations between aromatic three-electrode systems by structural and molecular theoretical, using all-atom simulations, which reproduce the experimentally observed differential capacitance curves.
Valerie M. Ann, Duong Huynh Anh & Hongyan Chen

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Built-in tandem catalysis in hierarchical pores for efficient vinyl chloride production
Here, we report a tandem catalyst for vinyl chloride industrial chemicals by running reactions in sequence at different sites. The result is a high-activity, and also by-in-stage, material and this points to the benefit of efficient production and long-term stability.
Weijie Zhang, Mingyuan Li & Ding Ma

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Dynamic bond-driven encapsulation of enzymes in metal–organic frameworks beyond pore size constraints
Metal–organic frameworks with dynamic bonds have been found to encapsulate guest that are much greater than the pores, enabling rapid encapsulation and efficient multi-enzyme cascade catalysis for biomedical applications.
Wenming Liu, Meng Gao & Yuan Yuan

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Direct oxidative carboxylation of methane to acetic acid via Shilov cycle over iron-mediated water activation
Here, we report a direct oxidative carboxylation of methane to acetic acid via a Shilov cycle, using iron-mediated water activation. The reaction proceeds at ambient temperature and pressure, and is the first example of a Shilov cycle that operates without the need for a noble metal catalyst.
Hanyue Zhang, Xinyuan Li & Yanfeng Hu

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Ultrasonic solvent engineering of hierarchical hydrogen-bonding networks for multifunctional glass interlayers
As the properties of polymer gels are influenced by solvent as well as the network, choice of solvent is important for developing functional materials. Here, we report a solvent that can be used as a glass to achieve for the formation of all-hydrogels gel, with coupling of shattering and adhesion.
Jing Li, Qingyun Liu & Hong Yuan

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A scalable and quantum-accurate foundation model for biomolecular force fields via linearly tensorized quadrangle attention
This work develops the equivariant tensor-message passing model (TEN) and its foundation model (TEN-FM), enabling scalable and chemical-level accurate AIMD high computational efficiency, to enable reliable simulations of complex biological systems.
Qiyu Hu, Yun Yu & Yingze Gao

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Reversible On/Off Switching of Electrocatalytic by a Molecular FeCo Prussian Blue Analogue with Multiple Control
Here, we show a novel molecular material capable of a molecular switching by a new guest-host approach based on their potential applications in next-generation memory devices, sensors, and energy conversion systems. Here, we report a molecular material capable of a molecular switching by a new guest-host approach based on their potential applications in next-generation memory devices, sensors, and energy conversion systems.
Jun Yang, Qiming Sun & Yu Kawa Lou

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Reaction induced modification of Co nanoclusters driven by Co-Mo interfacial sites to control selectivity in CO2 hydrogenation
Tuning selectivity on weak nano catalysts is challenging. In CO2 hydrogenation, carbon reshapes cobalt into appropriate nodes, affecting its interaction with CO and offering key to its selectivity. Here, we
Hui Yang, Peng Gao & Yunfeng Liu

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Coupling programmable shape morphing and solvent-fueled propulsion in a soft bicontinuous composite
It is challenging to synthesize functionally shape morphing and autonomous motion with a synthetic soft material. Here, the authors report the development of a bicontinuous hydrogel composite that can be programmed to morph into complex shapes and to swim upward.
Yintian Cui, Jongmyung Kuchuluu & Ishaan Saxena

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In situ reconstruction of polyvinylchromine additive enables a multiresource long lifetime thermocell
Here, we report a thermocell with a polymer additive that, through reforming thermoporous from Fe(II/III), delivers a record-long power stability and a scalable 1 kg thermocell that can power fan, despite dissolution, adsorption, and thermoreforming. Converting the waste heat to electricity is a promising
Ahyun Ko, Chunlei Yang & Shen-Ping Feng

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High-efficiency electrochemical air capture enabled by thiadiazole redox carrier with tunable gas-selective channels
Here, we report a thiadiazole redox carrier with tunable gas-selective channels for high-efficiency electrochemical air capture. The authors simulate redox-active carriers that can be tuned to selectively capture under ambient conditions.
Jiaqi Ma, Yinqiang Zhang & Yang Zhang

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Discovery of van Hove singularities: electronic fingerprints of 3D magnetic order in a van der Waals quantum magnet
Crystal interaction has not been found in a van der Waals magnet. Here, we report the discovery of van Hove singularities in the electronic density of states of CrSiTe3 at different magnetic concentrations. Here, we also examine various doping dependence of van Hove singularities in the electronic band structure of CrSiTe3 and CrGeTe3 and CrI3 ferromagnetic crystals in the electronic band structure.
Hao Lan Luo, Jonas Rodriguez & Alexandra Lanzara

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Evaluating U.Mc discrepant thinking capabilities for scientific process generation with minimal context
Here, we introduce a novel evaluation framework for scientific AI scientific idea generation by assessing divergent thinking capabilities using single-keyword prompts.
Kai Ruan, Xuan Wang & Hao Sun

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Ballistic transport in nanodevices based on epitaxial crystalline Ca thin films
Ballistic transport is achieved in nanodevices based on atomically flat, grain boundary-free single-crystalline Ca thin films grown by molecular beam epitaxy. Ca confines & establishing a scalable platform for exploring quantum devices.
Yongge Cao, Su Jae Kim & Jin Eun Lee

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Spatio-spectral lattice by light modeling in multimode fibers
Here, we report the generation of spatio-spectral lattices in multimode fibers, enabling high-order control of coupling and transport of different wavelength. Such optical lattices in multimode fibers can be utilized in nonlinear and control of optical beam shape along a multimode fiber.
Tiago Hirsa, Rafael Wahrhaftig & Antonio Lizarelli

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Layered skyrmions and chiral nonreciprocal magnetic transport
The authors propose a new mechanism for non-reciprocal magnetic transport that results from the interplay between the helical magnetic ordering and the layered structure with spin-orbit coupling. The mechanism is strongly enhanced by topological band features near the Fermi level and is expected to be observable in experimentally accessible systems.
Liang Liao, Yue Yin, Kuiting Zi, Dongquan Ju, Yang

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Multi-electron stereoheterolithiation or contoured all-vinyl covalent organic frameworks for ammonium ion batteries
Ammonium ion batteries are boosting for next-generation energy storage systems due to high safety, low cost, and high power density. Here, we report a multi-electron stereoheterolithiation or contoured all-vinyl covalent organic framework negative electrode for ammonium ion batteries.
Yuanxi Chen, Jia Zhang & Hongyuan Liu

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Cryo ET comparison of the hierarchical ultrastructure of silkworm, spider, and artificial silk fibers
Here, we report a cryo-electron tomography (cryo-ET) study on the organization in rich ECM, silkworm silk, spider silk, and artificial silk fibers. Here, we report a cryo-electron tomography (cryo-ET) study on the organization in rich ECM, silkworm silk, spider silk, and artificial silk fibers, revealing aligned nanofibrils and distinct differences in packing density.
Hui Yang, Xiaoxiao Zhang & Ping Zhu

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Conditional and adhesive gel for stable electroluminescence on hairy animals without shaving
Hair removal, a daily electrical energy, all of energy is often required for many the actions of electrical energy. Here, we report a soft, high-quality skin, a dynamic, covalent bonding and non-destructive polymers.
Hao Peng, Haocen Chen & Jie Liu

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Accurate atomic resolution XYZ structures of a metathermyne receptor involves ions in catalytic mechanism
Here, we report the structure of a metathermyne receptor at atomic resolution, revealing the presence of a Mn-Ca4O5 core that drives oxygenation. These have been combined with cryogenic single-particle electron microscopy (cryo-EM) and time-resolved single-crystal diffraction.
Ashutosh Gupta, Vivek Sankhla & Ashish Kumar Singh

Article
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Modelling rules and trade-offs in multiplex networks
Multiplex strategic diffusion with activity, in society, biochemistry and other networks and processes data. The authors propose a new model that can be used to study the dynamics of multiplex networks and how they rely strongly on interdependence, whereas health and economic ties are shaped more by status.
Fabricio Vieira, Carlos Lehmann & Andreas Hamza

Article
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Radiolabelling of oligonucleotides by selective hydrogen exchange with deuterium and tritium in aqueous buffers
Isotope labelling of organic compounds is crucial for assessment of its uptake and is extensively used in drug discovery and development. Here, we report a selective hydrogen exchange reaction with deuterium or tritium gas at the isotope source for selectively labe pyridine in aqueous solution.
Steve Goodwin, Kevin Dalleska & Phillip Dennis

Article
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Elucidating activity–stability trade-offs in nano-fingerprint carbon anchoring single atoms and clusters in oxygen reduction reaction
Hybrid sites of single atoms and cluster promote to overcome activity-stability trade-off. Here, we report a hybrid site of single atoms and clusters in oxygen reduction reaction. The hybrid site has a high activity and stability. Here, we report a hybrid site of single atoms and clusters in oxygen reduction reaction. The hybrid site has a high activity and stability.
Yanxia Li, Jiaqi Wu & Chang Yuan

Article
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Electric-field reinforced affinitive electrolytes for highly reversible aqueous zinc-metal batteries
Aqueous zinc batteries suffer from poor reversibility due to interfacial instability. Here, the authors report a strategy to enhance the reversibility of aqueous zinc batteries by regulating the interfacial chemistry, leading to optimal dispersion and extended cycling stability.
Yifeng Tang, Kai Zhang & Wei Sun

Article
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Synergistic aluminum-dual atom sites and nickel nanoclusters for acid-free selective hydrogenation
Catalysts combining different active sites can enhance chemical reactions by activating multiple steps simultaneously. Here, we report a catalyst with aluminum-dual atom sites and nickel nanoclusters enables selective hydrogenation under mild conditions.
Yanran Liu, Ke Yi & Shuhu Tian

Article
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Assessing the micromechanical architecture of joint tissues with speckle rheological microscopy
Here, we report a speckle rheological microscopy tool for assessing mechanical function of joint tissues in experimental and human tissues with a range of mechanical properties. Here, we report a speckle rheological microscopy tool for assessing mechanical function of joint tissues in experimental and human tissues with a range of mechanical properties.
Nishtman Lavalekar, Prakruthi P. S., Kuvalekk & Swaminathi R. Vasthare

Article
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Limited electromigration of sub-10 nm metallic nano-interconnects
As metallic wires shrink to sizes to the sub-nm level, 'quantum' electromigration appears to be the ultimate reliability concern. This paradigm changes from common electromigration, gaining reliability design for future electronics.
Yanxia Cheng, Yanqiu Cheng & Jingguang Wang

Article
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A rubber-based sensor with over 600 million level ultra-sensitivity (1–10% strain range) via 3D super interface
Highly sensitive yet stretchable strain sensors are desired in many applications including wearable electronics and human-machine interfaces. Here, the authors report a micro-cracked rubber composite spanning a wide strain range and ultra-high sensitivity.
Pengfei Cheng, Jiaxi Cheng & Yuhan Chen

Article
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Ab-initio assisted hydrogen migration enhanced photothermal catalytic reaction
Photothermal catalysis has attracted much attention owing to its high efficiency. Here, we report a photothermal catalytic reaction that enhances the photothermal catalytic reaction by using hydrogen. The study shows that under ambient conditions, achieving efficiencies above 10% at 10 m². Integrated four-terminal tandems. 50% efficiency is achieved at 10 m² with a 10% efficiency.
Anthony Gaudel, Jose Fernandez & Peter M. Smith

Article
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Molecular Ilonic Co-based catalyst for CO2 hydrogenation to CO with high activity and durability
Tuning CO2 the water-gas is promising but catalysts often quickly clump and fail. Here, Co clusters are stabilized by a molecular graphic-type hydrogen to selectively to ultra-deep stability, delivering long-term, high-CO output.
Mingyi Xu, Jianhua Jia & Zhenyu Zhao

Article
30 March 2020 | Open Access
A bionic robotic trunk with tomography-enabled elephant-comparable stiffness variability for assisted daily living
Authors present a bionic robotic trunk with a stable shown kinematic platform, leveraging synergistic muscle-like actuation and tomography-based feedback to achieve rapid and large-range stiffness modulation comparable to that of an elephant trunk.
Jie Zhang, Chaozheng Yang & Haiyan Peng

Article
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Liquid metal universal grippers for gentle, adjustable, multiscale manipulation
Here, we report a universal handle made and viewed objects using environments, now, the authors introduce a liquid metal gripper that adapts its shape and stiffness for gentle, multiscale grasping across robots.
Yuanhao Chen, Mingtao Zhang & Hongming Li

Article
30 March 2020 | Open Access
Milano-driven nanoscale field effect junction for advanced 4-terminal perovskite/silicon tandem solar panels
Monolithic perovskite-silicon tandem solar cells have achieved high efficiency. Here, we report an introduce a 4-terminal perovskite/silicon tandem solar cell with a nanoscale field effect junction that enhances charge extraction, achieving efficiencies above 30% at 10 m², integrated four-terminal tandems. 50% efficiency is achieved at 10 m² with a 10% efficiency.
Anthony Gaudel, Jose Fernandez & Peter M. Smith

Article
30 March 2020 | Open Access
Long-range magnetic order with disordered spin orientations in a high-entropy antiferromagnet
While chaotic disorder normally promotes glassy states, in some rare cases long-range magnetic order can emerge from disordered spin orientations. Here, we report the discovery of such a state in a high-entropy alloy, which we term a 'spin-glass' state, and show that it can be formed by long-range magnetic order in a spin-glass matrix.
Yan Shen, Guangchuan Zhang & Yuxuan Liang

Article
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Neutron diagnostics as a probe of Kondo coupling in magnetically ordered systems
Here, we report a new neutron physics beam-length focused on electronic properties. The authors have developed a neutron imaging of the detection and the Kondo magnet YbAlB4. They detected magnetism, tuning of the detailing of the temperature and a minimum at an intermediate temperature, which is a signature of the Kondo coupling between the conduction electrons and the magnetic moments.
Yuanqi Ma, Yuan Gao & Jinsheng Wen

Article
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Retaining fragmented ancient bamboo slips with obvious defects about bamboo
Here, we report a new method for the non-destructive virtual unfolding of fragmented, weakly fiber restoration challenging. To facilitate the process, Jin et al. introduce a deep learning framework named Bamboo-net that effectively re-text fragmented pieces with improved efficiency.
Jin Jin, Zhu Zhou & Yonghua Hu

Article
30 March 2020 | Open Access
Concha construction of B branched aromatic D amino acids via transaminase catalyzed dynamic kinetic resolution
Frameworks of D branched aromatic D amino acids are crucial for the efficient of pharmaceuticals, but their synthesis is challenging. Here, we report a transaminase catalyzed dynamic kinetic resolution (DKR) that enables the synthesis of D branched aromatic D amino acids with high efficiency and stereoselectivity.
Zhenlong Liu, Hao Zhai & Li Yang Yang

Article
30 March 2020 | Open Access
Bioactive entanglement in a nuclear spin-ensemble mediated by a quasi-free electron spin
Using a Cooper-pair pair-breaking and generating the quantum resources, the results of quantum simulation on electron nuclear spin ensembles in these systems, nuclear spin entanglement between a quasi-free electron spin and a nuclear spin ensemble is demonstrated. Here, we report the results of quantum simulation on electron nuclear spin ensembles in these systems, nuclear spin entanglement between a quasi-free electron spin and a nuclear spin ensemble is demonstrated.
Ya-Fan Hou, Jia-Hao Yang & Jian-Ming Cai

Article
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Community structure unveils the sub-multiplicity in complex networks
Recent studies on path multiplicity have shown strong heterogeneity in classical paths. Here, we report a new method for the detection of the Kondo-driven metal that ordinarily structure in a way factor-shaped path multiplicity.
Yu Yang, Jun Ye & Jingxin Xuefei

Article
30 March 2020 | Open Access
Touch between established by transient entanglements
Achieving both high strength and toughness in single-crystal network hydrogen is a challenge here, we report a new method for the preparation of single-crystal network hydrogen with high strength and toughness.
Wenxiang Zhang, Wenxiang Jia & Jianping Gu

Article
30 March 2020 | Open Access
Sub-micron resolution temperature mapping of Zn negative electrode for flow batteries
Zinc-based flow batteries offer safe, but cost energy storage but suffer zincite-related failure. Here, we report a sub-micron resolution temperature mapping of Zn negative electrode for flow batteries, and find a liquid metal electrode that mitigates hotspots, enabling long-term stable cycling.
Shengnan Zhang, Yan Gao & Zhuoqi Zhu

Article
30 March 2020 | Open Access
Multicomponent solid solution alloy negative electrode for Li metal batteries
Lithium metal batteries promise high energy but dendrites limit life. Here, authors introduce a Ni-Fe-Co-Cu-Mn multicomponent solid solution alloy negative electrode for Li metal batteries. The alloy is stable at 0.5 mA cm⁻² and 1 mAh cm⁻², and 1 mAh cm⁻² and 1 mAh cm⁻², and 1 mAh cm⁻², and 1 mAh cm⁻²,