

# Science Newsletter

2023 Volume 2 (Total 38) Website: <http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm>  
June, 2023

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# Introduction:

There are 3 main elements in the Science Newsletter is composed. In the first part, we provide articles about central issues for each discipline in this university, and they are provided with one subject for a time. In the second part, we select articles from the top journals in the whole science research, and most of them are from Nature and Science. In the third part, we post information about calling papers for international conferences. Hopefully, some of the information in this manuscript may be useful for those who are dedicating to scientific career. Besides, the journals are also posted on the website of our library, and they are available to be accessed any time at <http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm>. If there are any questions or suggestions, please send e-mails to [2019560078@jsut.edu.cn](mailto:2019560078@jsut.edu.cn) in no hesitate.

## I Topics

The key word of this month is **Material science**.

We list several articles which are related to the top concerned topics of computer science researches. The articles are classified in 5 categories, and they are: **Metals, Nanostructured materials, Graphene, Polymers and plastics and Ceramics and composites**. Also, the listed articles are all arranged in a descending sort of impact factor in order to make it convenient to read. There are also links to both official site and full text for each article.

### METALS

Angewandte Chemie-International Edition (impact factor: 16.823) 1 

#### **Carboxylic Acid Salts as Dual-Function Reagents for Carboxylation and Carbon Isotope Labeling**


*Shuo Wang, Igor Larrosa, Hideki Yorimitsu, et. al*

#### **Abstract:**

The potassium salts of carboxylic acids are developed as efficient carboxylating agents through CO<sub>2</sub> exchange. We describe these carboxylates as dual-function reagents because they function as a combined source of CO<sub>2</sub> and base/metalating agent. By using the salt of a commercially available carboxylic acid, this protocol overcomes

difficulties when using CO<sub>2</sub> gas or organometallic reagents, such as pressurized containers or strictly inert conditions. The reaction proceeds under mild conditions, does not require transition metals or other additives, and shows broad substrate scope. Through the preparation of several biologically important molecules, we show how this strategy provides an opportunity for isotope labeling with low equivalents of labeled CO<sub>2</sub>.

Source: <http://www.kingbook.com.cn/xz.htm>

Advanced Materials (impact factor: 32.086) 1 

### **3D Printing of Electron/Ion-Flux Dual-Gradient Anodes for Dendrite-Free Zinc Batteries**

*Hanna He, Li Zeng, Dan Luo, Jun He, et. al*

#### **Abstract:**

3D porous Zn-metal anodes have aroused widespread interest for Zn-ion batteries (ZIBs). Nevertheless, the notorious “top-growth” dendrites caused by the intrinsic top-concentrated ions and randomly distributed electrons may ultimately trigger a cell failure. Herein, an electron/ion-flux dual-gradient 3D porous Zn anode is reported for dendrite-free ZIBs by adopting 3D printing technology. The 3D-printed Zn anode with layer-by-layer bottom-up attenuating Ag nanoparticles (3DP-BU@Zn) establishes dual-gradient electron/ion fluxes, i.e., an internal bottom-up gradient electron flux created by bottom-rich conductive Ag nanoparticles, and a gradient ion flux resulting from zincophilic Ag nanoparticles which pump ions toward the bottom. Meanwhile, the 3D-printing-enabled hierarchical porous structure and continuously conducting network endow unimpeded electron transfer and ion diffusion among the electrode, dominating a bottom-preferential Zn deposition behavior. As a result, the 3DP-BU@Zn symmetrical cell affords highly reversible Zn plating/stripping with an extremely small voltage hysteresis of 17.7 mV and a superior lifespan over 630 h at 1 mA cm<sup>-2</sup> and 1 mAh cm<sup>-2</sup>. Meanwhile, the 3DP-BU@Zn//VO<sub>2</sub> full cell exhibits remarkable cyclic stability over 500 cycles. This unique dual-gradient strategy sheds light on the roadmap for the next-generation safe and durable Zn-metal batteries.

Source: <http://www.kingbook.com.cn/xz.htm>

Advanced Functional Materials (impact factor: 19.924) 1 

### **High-Pressure Synthesis and Thermal Conductivity of Semimetallic $\theta$ -Tantalum Nitride**

*Hwijong Lee, Yuanyuan Zhou, Sungyeob Jung, et. al*

#### **Abstract:**

The lattice thermal conductivity ( $\kappa_{ph}$ ) of metals and semimetals is limited by phonon-phonon scattering at high temperatures and by electron-phonon scattering at low temperatures or in some systems with weak phonon-phonon scattering. Following the demonstration of a phonon band engineering approach to achieve an unusually high  $\kappa_{ph}$  in semiconducting cubic-boron arsenide (c-BAs), recent theories have predicted ultrahigh  $\kappa_{ph}$  of the semimetal tantalum nitride in the  $\theta$ -phase ( $\theta$ -TaN) with hexagonal tungsten carbide (WC) structure due to the combination of a small electron density of states near the Fermi level and a large phonon band gap, which suppress electron-phonon and three-phonon scattering, respectively. Here, measurements on the thermal and electrical transport properties of polycrystalline  $\theta$ -TaN converted from the  $\epsilon$  phase via high-pressure synthesis are reported. The measured thermal conductivity of the  $\theta$ -TaN samples shows weak temperature dependence above 200 K and reaches up to  $90 \text{ W m}^{-1} \text{ K}^{-1}$ , one order of magnitude higher than values reported for polycrystalline  $\epsilon$ -TaN and  $\delta$ -TaN thin films. These results agree with theoretical calculations that account for phonon scattering by 100 nm-level grains and suggest  $\kappa_{ph}$  increase above the  $249 \text{ W m}^{-1} \text{ K}^{-1}$  value predicted for single-crystal WC when the grain size of  $\theta$ -TaN is increased above 400 nm.

Source: <http://www.kingbook.com.cn/xz.htm>

Angewandte Chemie-International Edition (impact factor: 16.823) 1 

### Designing Heteroatom-Codoped Iron Metal–Organic Framework for Promotional Photoreduction of Carbon Dioxide to Ethylene

*Nabilah Al-Ansi, Abdulwahab Salah, Jian Lin, et. Al*

#### Abstract:

Rational engineering active sites and vantage defects of catalysts are promising but grand challenging task to enhance photoreduction  $\text{CO}_2$  to high value-added  $\text{C}_2$  products. In this study, we designed an N,S-codoped Fe-based MIL-88B catalyst with well-defined bipyramidal hexagonal prism morphology via a facile and effective process, which was synthesized by addition of appropriate 1,2-benzisothiazolin-3-one (BIT) and acetic acid to the reaction solution. Under simulated solar irradiation, the designed catalyst exhibits high  $\text{C}_2\text{H}_4$  evolution yield of  $17.7 \mu\text{mol g}^{-1}\cdot\text{h}$ , which has been rarely achieved in photocatalytic  $\text{CO}_2$  reduction process. The synergistic effect of Fe-N coordinated sites and reasonable defects in the N,S-codoped photocatalyst can accelerate the migration of photogenerated carriers, resulting in high electron density, and this in turn helps to facilitate the formation and dimerization of C–C coupling intermediates for  $\text{C}_2\text{H}_4$  effectively.

Source: <http://www.kingbook.com.cn/xz.htm>

Applied Energy (impact factor: 11.446) 1 ☒

### **Fabrication and synergistic control of ternary TiO<sub>2</sub>/MoO<sub>2</sub>@NC hollow spheres for high-performance lithium/sodium-ion batteries anodes**

*Nabilah Al-Ansi, Abdulwahab Salah, Jian Lin, et. al*

#### **Abstract:**

Constructing nanostructured hollow materials is one of the most effective approaches to improve the cycling stability in batteries by accommodating the volume variation. Combined with the synergy of hybrid composition, high-performance energy storage materials are expected to be achieved. Herein, the anatase TiO<sub>2</sub> is coated into a MoO<sub>2</sub>@N-doped carbon hollow sphere structure (denoted as TiO<sub>2</sub>/MoO<sub>2</sub>@NC HS) through a simple two-step method. The unique TiO<sub>2</sub>/MoO<sub>2</sub>@NC HS composite overcomes the poor cyclic stability of MoO<sub>2</sub> and the low specific capacity of TiO<sub>2</sub>. Moreover, its hollow sphere structure facilitates electrolyte access and simultaneously provides shorter charge transportation paths, which assures rapid Li<sup>+</sup>/Na<sup>+</sup> reaction kinetics. When utilized as an anode in LIBs /SIBs, TiO<sub>2</sub>/MoO<sub>2</sub>@NC HS composite exhibits a satisfactory electrochemical performance with high reversible capacities of 1423.9 mAh g<sup>-1</sup> at 100 mA g<sup>-1</sup> after 200 cycles in LIBs and reaches 572.7 mAh g<sup>-1</sup> after 1000 cycles at 200 mA g<sup>-1</sup> in SIBs. Furthermore, the full cell TiO<sub>2</sub>/MoO<sub>2</sub>@NC HS anode coupled with NCM111 cathode shows decent capacity with long cycling stability. This study offers a novel strategy to obtain anode composite that will find applications in energy storage devices.

**Source:** <http://www.kingbook.com.cn/xz.htm>

Nature Communications (impact factor: 17.694) 1 ☒

### **Monometallic interphasic synergy via nano-hetero-interfacing for hydrogen evolution in alkaline electrolytes**

*Kamran Dastafkan, Xiangjian Shen, Rosalie K. Hocking, et. al*

#### **Abstract:**

Electrocatalytic synergy is a functional yet underrated concept in electrocatalysis. Often, it materializes as intermetallic interaction between different metals. We demonstrate interphasic synergy in monometallic structures is as much effective. An interphasic synergy between Ni(OH)<sub>2</sub> and Ni-N/Ni-C phases is reported for alkaline hydrogen evolution reaction that lowers the energy barriers for hydrogen adsorption-desorption and facilitates that of hydroxyl intermediates. This makes ready-to-serve Ni active sites and allocates a large amount of Ni d-states at Fermi level to promote charge redistribution from Ni(OH)<sub>2</sub> to Ni-N/Ni-C and the co-adsorption of H<sub>ads</sub> and OH<sub>ads</sub>

intermediates on Ni-N/Ni-C moieties. As a result, a Ni(OH)<sub>2</sub>@Ni-N/Ni-C hetero-hierarchical nanostructure is developed, lowering the overpotentials to deliver -10 and -100 mA cm<sup>-2</sup> in alkaline media by 102 and 113 mV, respectively, compared to monophasic Ni(OH)<sub>2</sub> catalyst. This study unveils the interphasic synergy as an effective strategy to design monometallic electrocatalysts for water splitting and other energy applications.

Source: <http://www.kingbook.com.cn/xz.htm>

Advanced Science (impact factor: 17.521) 1 ☒

### **Small Molecule-Templated DNA Hydrogel with Record Stiffness Integrates and Releases DNA Nanostructures and Gene Silencing Nucleic Acids**

*Christophe Lachance-Brais, Mostafa Rammal, Jathavan Asohan, et. al*

#### **Abstract:**

Deoxyribonucleic acid (DNA) hydrogels are a unique class of programmable, biocompatible materials able to respond to complex stimuli, making them valuable in drug delivery, analyte detection, cell growth, and shape-memory materials. However, unmodified DNA hydrogels in the literature are very soft, rarely reaching a storage modulus of 103 Pa, and they lack functionality, limiting their applications. Here, a DNA/small-molecule motif to create stiff hydrogels from unmodified DNA, reaching 105 Pa in storage modulus is used. The motif consists of an interaction between polyadenine and cyanuric acid—which has 3-thymine like faces—into multimicrometer supramolecular fibers. The mechanical properties of these hydrogels are readily tuned, they are self-healing and thixotropic. They integrate a high density of small, nontoxic molecules, and are functionalized simply by varying the molecule sidechain. They respond to three independent stimuli, including a small molecule stimulus. These stimuli are used to integrate and release DNA wireframe and DNA origami nanostructures within the hydrogel. The hydrogel is applied as an injectable delivery vector, releasing an antisense oligonucleotide in cells, and increasing its gene silencing efficacy. This work provides tunable, stimuli-responsive, exceptionally stiff all-DNA hydrogels from simple sequences, extending these materials' capabilities.

Source: <http://www.kingbook.com.cn/xz.htm>

Chemical Engineering Journal (impact factor: 16.744) 1 ☒

### **BCN nanostructures conjugated nanoporous carbon with oxygenated surface and high specific surface area for enhanced CO<sub>2</sub> capture and supercapacitance**

*Rohan Bahadur, Gurwinder Singh, Mengyao Li, et. al*

**Abstract:**

Porous carbons, owing to their fascinating properties, are materials of high interest in several fields including gas capture and energy storage. The conjugation of nanostructures such as BCN and surface functionalization is a creative approach to enhance their application potential. However, maintaining high porosity along with the creation of such features is rather complicated. Herein, we report on BCN conjugated nanoporous carbons with the high specific surface area through a unique approach of integrating the synthesis method of BCN and nanoporous carbon with chemical activation. In this approach, the high nitrogen containing precursor, aminoguanidine was mixed with boric acid, casein, and potassium acetate at 900 °C. The characterization data revealed the existence of BCN nanostructures in nanoporous carbon with a high specific surface area (2991 m<sup>2</sup> g<sup>-1</sup>) and oxygen functional groups. The BCN content and the physicochemical properties of the hybrids can be easily tuned by varying the amount of AG in the synthesis mixture. The optimized sample exhibited a high CO<sub>2</sub> adsorption capacity of 23.25 mmol g<sup>-1</sup> at 0 °C and 30 bar and a high specific capacitance of 182.5 F g<sup>-1</sup> at 1 A g<sup>-1</sup> with exceptional stability and low resistance in a three-electrode supercapacitor system. The superior performance of synthesized materials for intended applications can be attributed to the synergetic effect of unique porous characteristics, BCN conjugation, and oxygen functionalization in nanoporous carbon. These exceptional results make this facile method of BCN conjugation of porous carbon a highly useful pathway to synthesize a variety of hybrid nanoporous carbon nanostructures for adsorption using such materials, the use of which can further be extended to more applications.

**Source:** <http://www.kingbook.com.cn/xz.htm>

## GRAPHENE

ACS Catalysis (impact factor: 13.7) 1 ☒

### **Size-Dependent Energy and Adhesion of Pd Nanoparticles on Graphene on Ni(111) by Pd Vapor Adsorption Calorimetry**


*Kun Zhao, Nida Janulaitis, John R. Rumpitz, et. al*

**Abstract:**

Carbon-supported late transition-metal nanoparticles are promising catalysts and electrocatalysts for wide-ranging applications. However, experimental investigations of the bonding energetics of metal nanoparticles on carbon supports are very limited. Here, we report heats of adsorption of Pd vapor deposited onto single-layer graphene(0001) supported on Ni(111) at 100 and 300 K as Pd grows particles of well-defined size in the range from three atom clusters to 6 nm diameter. Sizes were determined from He<sup>+</sup> low-

energy ion scattering (LEIS). In this size range, the differential heat of Pd adsorption increases from 228 kJ/mol to within 10 kJ/mol of the heat of sublimation of bulk Pd (377 kJ/mol). The chemical potential of metal atoms in these nanoparticles as a function of average particle size was determined from these results. The adhesion energy at the Pd/graphene(0001)/Ni(111) interface was extracted from these data and found to be 3.5 J/m<sup>2</sup> for the largest Pd particles. For the three metal elements that have now been studied (Pd, Ni, and Ag), we found an increase in metal/graphene(0001)/Ni(111) adhesion energy with metal carbophilicity, which we defined here as the heat of C atom adsorption on that metal's (111) surface estimated from published density functional theory calculations.

**Source:** <http://www.kingbook.com.cn/xz.htm>

Light-Science & Applications (impact factor: 20.257) 1 


### **Graphene/MoS<sub>2-x</sub>O<sub>x</sub>/graphene photomemristor with tunable non-volatile responsivities for neuromorphic vision processing**

*Xiao Fu, Tangxin Li · Bin Cai, et. al*

#### **Abstract:**

Conventional artificial intelligence (AI) machine vision technology, based on the von Neumann architecture, uses separate sensing, computing, and storage units to process huge amounts of vision data generated in sensory terminals. The frequent movement of redundant data between sensors, processors and memory, however, results in high-power consumption and latency. A more efficient approach is to offload some of the memory and computational tasks to sensor elements that can perceive and process the optical signal simultaneously. Here, we proposed a non-volatile photomemristor, in which the reconfigurable responsivity can be modulated by the charge and/or photon flux through it and further stored in the device. The non-volatile photomemristor has a simple two-terminal architecture, in which photoexcited carriers and oxygen-related ions are coupled, leading to a displaced and pinched hysteresis in the current-voltage characteristics. For the first time, non-volatile photomemristors implement computationally complete logic with photoresponse-stateful operations, for which the same photomemristor serves as both a logic gate and memory, using photoresponse as a physical state variable instead of light, voltage and memresistance. The polarity reversal of photomemristors shows great potential for in-memory sensing and computing with feature extraction and image recognition for neuromorphic vision.

**Source:** <http://www.kingbook.com.cn/xz.htm>

Green Chemistry (impact factor: 11.034) 1 

### **Metal-free cysteamine-functionalized graphene alleviates mutual**




## interferences in heavy metal electrochemical detection

Qiuyue Yang, Emily P. Nguyen, David Panáček, et. al

### Abstract:

Heavy metal pollutants are of great concern to environmental monitoring due to their potent toxicity. Electrochemical detection, one of the main techniques, is hindered by the mutual interferences of various heavy metal ions in practical use. In particular, the sensitivity of carbon electrodes to  $\text{Cd}^{2+}$  ions (one of the most toxic heavy metals) is often overshadowed by some heavy metals (e.g.  $\text{Pb}^{2+}$  and  $\text{Cu}^{2+}$ ). To mitigate interference, metallic particles/films (e.g. Hg, Au, Bi, and Sn) typically need to be embedded in the carbon electrodes. However, these additional metallic materials may face issues of secondary pollution and unsustainability. In this study, a metal-free and sustainable nanomaterial, namely cysteamine covalently functionalized graphene (GSH), was found to lead to a 6-fold boost in the  $\text{Cd}^{2+}$  sensitivity of the screen-printed carbon electrode (SPCE), while the sensitivities to  $\text{Pb}^{2+}$  and  $\text{Cu}^{2+}$  were not influenced in simultaneous detection. The selective enhancement could be attributed to the grafted thiols on GSH sheets with good affinity to  $\text{Cd}^{2+}$  ions based on Pearson's hard and soft acid and base principle. More intriguingly, the GSH-modified SPCE (GSH-SPCE) featured high reusability with extended cycling times (23 times), surpassing the state-of-art SPCEs modified by non-covalently functionalized graphene derivatives. Last, the GSH-SPCE was validated in tap water.

Source: <http://www.kingbook.com.cn/xz.htm>

Advanced Science (impact factor: 17.521)1 

### High Performance Graphene-C<sub>60</sub>-Bismuth Telluride-C<sub>60</sub>-Graphene Nanometer Thin Film Phototransistor with Adjustable Positive and Negative Responses

Rui Pan, Yuanlingyun Cai, Feifei Zhang, et. al


### Abstract

Graphene is a promising candidate for the next-generation infrared array image sensors at room temperature due to its high mobility, tunable energy band, wide band absorption, and compatibility with complementary metal oxide semiconductor process. However, it is difficult to simultaneously obtain ultrafast response time and ultrahigh responsivity, which limits the further improvement of graphene photoconductive devices. Here, a novel graphene/C<sub>60</sub>/bismuth telluride/C<sub>60</sub>/graphene vertical heterojunction phototransistor is proposed. The response spectral range covers 400–1800 nm; the responsivity peak is 106 A W<sup>-1</sup>; and the peak detection rate and peak response speed reach 1014 Jones and 250 μs, respectively. In addition, the regulation of positive and negative photocurrents at a gate voltage is characterized and the

ionization process in impurities of the designed phototransistor at a low temperature is analyzed. Tunable bidirectional response provides a new degree of freedom for phototransistors' signal resolution. The analysis of the dynamic change process of impurity energy level is conducted to improve the device's performance. From the perspective of manufacturing process, the ultrathin phototransistor (20–30 nm) is compatible with functional metasurface to realize wavelength or polarization selection, making it possible to achieve large-scale production of integrated spectrometer or polarization imaging sensor by nanoimprinting process.

Source: <http://www.kingbook.com.cn/xz.htm>

## POLYMERS AND PLASTICS

Journal of Hazardous Materials (impact factor: 14.224) 1 

### **Biodegradation of low-density polyethylene plastic waste by a constructed tri-culture yeast consortium from wood-feeding termite: Degradation mechanism and pathway**

*Tamer Elsamahy, Jianzhong Sun, Sobhy E. Elsilik, et. al*

#### **Abstract**

Polyethylene (PE) is one of the most common synthetic polymers, and PE waste pollution has been an environmental and health concern for decades. Biodegradation is the most eco-friendly and effective approach for plastic waste management. Recently, an emphasis has been placed on novel symbiotic yeasts isolated from termite guts as promising microbiomes for multiple biotechnological applications. This study might be the first to explore the potential of a constructed tri-culture yeast consortium, designated as DYC, isolated from termites for the degradation of low-density polyethylene (LDPE). The yeast consortium DYC stands for the molecularly identified species *Sterigmatomyces halophilus*, *Meyerozyma guilliermondii*, and *Meyerozyma caribbica*. The LDPE-DYC consortium showed a high growth rate on UV-sterilized LDPE as a sole carbon source, resulting in a reduction in tensile strength (TS) of 63.4% and a net LDPE mass reduction of 33.2% compared to the individual yeasts. All yeasts, individually and in consortium, showed a high production rate for LDPE-degrading enzymes. The hypothetical LDPE biodegradation pathway that was proposed revealed the formation of several metabolites, including alkanes, aldehydes, ethanol, and fatty acids. This study emphasizes a novel concept for using LDPE-degrading yeasts from wood-feeding termites for plastic waste biodegradation.

Source: <http://www.kingbook.com.cn/xz.htm>

## Chemical recycling of a lignin-based non-isocyanate polyurethane foam

*Ana Carolina Jerdy, Tram Pham, Miguel Ángel González-Borja, et. al*

### Abstract

The crisis of plastic waste in the environment calls for new polymers that are designed specifically for recycling at the end of their life. Lignin, which is present in approximately 15–40% of woody biomass, is an attractive biobased source for polymers given its aromatic nature. However, the use of lignin in polymers is complicated by its own reactivity and heterogeneous structure, factors that also create difficulties for designing end-of-life solutions for lignin-based polymers. Here we demonstrate a chemical recycling technique that prevents the loss of functionality to lignin and produces a recycled precursor capable of entering back into the synthetic sequence for non-isocyanate polyurethane foams. This technique enables the depolymerization of the polymer and isolation of lignin with enhanced solubility and hydroxyl content so that it can be reused in second-generation polymers. Detailed structural analysis of lignin after chemical recycling reveals the insertion of ethylene glycol in the side-chain region during a high-pressure hydrolysis recycling procedure. The closed-loop recycling process for the lignin-derived non-isocyanate polyurethane foam demonstrates a pathway towards a circular economy.

**Source:** <http://www.kingbook.com.cn/xz.htm>

## Restricted access medium magnetic molecularly imprinted polymers: Validation of their suitability as an effective quantitation tool against phthalates in food products packaged in plastic

*Shikha Bhogal, Irshad Mohiuddin, Ki-Hyun Kim, et. al*

### Abstract

A highly effective approach has been established for the selective identification and isolation for a list of phthalates (PTHs: e.g., dimethyl phthalate, dipropyl phthalate, dibutyl phthalate, benzyl butyl phthalate, and dioctyl phthalate) based on restricted access medium magnetic molecularly imprinted polymer (RAM-MMIP). The RAM-MMIP has been synthesized by a surface imprinting method using: (i)  $\text{Fe}_3\text{O}_4@\text{SiO}_2$  as the support material, (ii) diethyl phthalate and dicyclohexyl phthalate as dual dummy templates, and (iii) (3-glycidyloxypropyl)trimethoxysilane as the silane coupling agent to impart hydrophilic properties to the polymer. The adsorption kinetic and isotherm studies confirm the good match of experimental results with the Langmuir and pseudo-second order model. The RAM-MMIP exhibits great selectivity toward PTHs and recyclability for up to seven cycles. It has been applied for the extraction of PTHs from

foods packaged in plastic (bottled water, juice, and milk samples) via magnetic solid phase extraction coupled with gas chromatography/mass spectrometry (recovery: 88.53–121.57 % (RSD% = 1.30–5.15 %) and LOD (0.01–0.03 ng/mL)). The overall results of this study suggest that the RAM-MMIP is a highly recommendable option for efficient extraction and quantitation of PTHs.

**Source:** <http://www.kingbook.com.cn/xz.htm>

## CERAMICS AND COMPOSITES

Composites Part B-Engineering (impact factor: 11.322) 1 ☒

### **Significant improvement of ultra-high temperature oxidation resistance of C/SiC composites upon matrix modification by SiHfBCN ceramics**

*Xinming Xu, Xingang Luan, Jiahao Zhang, et. al*

#### **Abstract**

Advanced C/SiC-SiHfBCN composites were prepared by modification of the matrix of C/SiC composites with single-source-precursor derived SiHfBCN ceramics. Ultra-high temperature oxidation behavior of the C/SiC-SiHfBCN composites under laser heating were systematically studied. The influence of temperature, preform structure and precursor on oxidation resistance of the composites were analyzed. The results revealed that the preform structure and precursor can influence the oxidation behavior of C/SiC-SiHfBCN composites by effecting its thermal conductivity in the thickness direction. The Hf-containing oxide layer formed during ultra-high temperature oxidation test can effectively protect the internal carbon fibers from being oxidized. Linear ablation rate of C/SiC-SiHfBCN composites was more than an order of magnitude lower than that of other reported C/SiC composites, indicating an enhanced ablation resistance of the C/SiC-SiHfBCN composites.

**Source:** <http://www.kingbook.com.cn/xz.htm>

International Journal of Plasticity (impact factor: 8.5) 1 ☒

### **Enhancing the toughness of nano-composite coating for light alloys by the plastic phase transformation of zirconia**

*Weifeng Qian, Zhen Zhang, Shuang Wang, et. al*

#### **Abstract:**

Toughness of ceramic coatings is essential for engineering deploys of light alloys, especially for the scenarios tackling with corrosion and wear. This work reports a

toughened ZrO<sub>2</sub>/MgO coating on Mg alloy enabled by stress-induced martensite transformation from tetragonal zirconia (t-ZrO<sub>2</sub>) to monoclinic zirconia (m-ZrO<sub>2</sub>), which is achieved by the plasma electrolytic oxidation (PEO) process. Observations reveal that the interfaces between ZrO<sub>2</sub> and MgO grains are essential in inducing phase transition during the toughening process. Interestingly, semi-coherent interfaces were found between t-ZrO<sub>2</sub> and MgO, and the mismatched atoms at the interface cause local lattice distortions. These lattice distortions provide an appropriate dislocation density ( $2.2 \times 10^5 / \text{m}^2$ – $4.1 \times 10^5 / \text{m}^2$ ), which not only ensures the stability of the interface but also provides a stress transfer channel to induce martensite transformation of ZrO<sub>2</sub>. The plastic phase transformation is accompanied with volume expansion of ZrO<sub>2</sub> grains, thus a compressive stress field is generated to resist the crack propagation with an enhancement of the plasticity of the composite ceramics. As a result, the toughness of the enhanced coating is about 1.15 times higher than that of the traditional PEO coating. This work provides an alternative strategy for designing toughened ceramic coatings for light alloys.

Source: <http://www.kingbook.com.cn/xz.htm>

International Journal Of Machine Tools & Manufacture (impact factor: 10.331) 1 ☒

### **Machining of long ceramic fibre reinforced metal matrix composites – How could temperature influence the cutting mechanisms?**

*Shusong Zan, Zhirong Liao, Jose A. Robles-Linares, et. al*

#### **Abstract:**

Metal matrix composites (MMCs) offer a unique set of properties due to the ductile-brittle combination produced by the matrix and the reinforcements. Conventional MMCs are usually particle-reinforced, and their cutting mechanisms have been thoroughly studied, showing that they tend to follow traditional cutting theory as the particles roll within the surface/chip or are pushed in/pulled out of the machined surfaces. However, while the enforcement mechanism is quite unique in fibre reinforced MMCs, very little is known about the cutting mechanisms of this kind of materials. These materials are distinguished for having a, roughly, one-to-one scale alternation of the ductile (i.e., matrix) and hard/brittle (i.e., ceramic fibres) phases; key characteristic that is likely to heavily influence the material removal mechanism. Further, there is an open question on how the (temperature-dependent) stiffness of the matrix would affect the cutting mechanism when considering the hybrid machining process (e.g., heat assisted/cryogenic machining) to improve their machinability. To elucidate these aspects, here, by means of cutting a SiCf/Ti-6Al-4V MMC, the following particularities/peculiarities of the cutting mechanism of these structures are reported: (1) the chip formation includes, up to now unobserved, extrusion of the ductile component of the MMC (Ti-6Al-4V matrix) between the fractured hard phase (SiC); (2) the properties and deformation mechanisms of the matrix (adjusted by temperature

control:  $-180\text{ }^{\circ}\text{C}$ ;  $24\text{ }^{\circ}\text{C}$ ;  $400\text{ }^{\circ}\text{C}$ ) will affect the crack initiation of the SiC hard/brittle fibre which is manifested underneath the machined surface. Thus, this work is unique in its approach as it opens the understanding of how these complex and heterogeneous structures could be “activated” (e.g., by thermal means to change the stiffness of a particular phase) for improved cutting conditions.

**Source:** <http://www.kingbook.com.cn/xz.htm>

Journal of the European Ceramic Society (impact factor: 6.364) 1 ☒

### **Glass-ceramics for joining oxide-based ceramic matrix composites ( $\text{Al}_2\text{O}_3/\text{Al}_2\text{O}_3\text{-ZrO}_2$ ) operating under direct flame exposure**

*Carla Malinverni, Milena Salvo, Alessandro De Zanet, et. al*

#### **Abstract:**

This work focuses on the joining processes of oxide-based ceramic matrix composites ( $\text{Al}_2\text{O}_3/\text{Al}_2\text{O}_3\text{-ZrO}_2$ ), which are used as radiant tube furnace components in the steel industry. These components have to operate in harsh environments, and under high temperatures, and they therefore have to resist corrosion, humidity, and combustion. Two glass-ceramics systems, which have  $\text{Y}_2\text{Ti}_2\text{O}_7$  as their main crystalline phase, as well as specific and optimized properties to withstand severe operating conditions, including temperatures of  $900\text{ }^{\circ}\text{C}$ , are here proposed as joining materials. The adhesion of the glass-ceramics to the composite was found to be excellent after mechanical and thermal tests in which they were in direct contact with a  $900\text{ }^{\circ}\text{C}$  flame and thermal cycling of between  $400\text{ }^{\circ}\text{C}$  and  $900\text{ }^{\circ}\text{C}$ .

**Source:** <http://www.kingbook.com.cn/xz.htm>

# II Concentration

## PHYSICS

### **Room-temperature magnetoresistance in an all-antiferromagnetic tunnel junction**

*Peixin Qin, Han Yan, Xiaoning Wang, et al.*

#### **Abstract**

Antiferromagnetic spintronics<sup>1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16</sup> is a rapidly growing field in condensed-matter physics and information technology with potential applications for high-density and ultrafast information devices. However, the practical application of these devices has been largely limited by small electrical outputs at room temperature. Here we describe a room-temperature exchange-bias effect between a collinear antiferromagnet, MnPt, and a non-collinear antiferromagnet, Mn<sub>3</sub>Pt, which together are similar to a ferromagnet–antiferromagnet exchange-bias system. We use this exotic effect to build all-antiferromagnetic tunnel junctions with large nonvolatile room-temperature magnetoresistance values that reach a maximum of about 100%. Atomistic spin dynamics simulations reveal that uncompensated localized spins at the interface of MnPt produce the exchange bias. First-principles calculations indicate that the remarkable tunnelling magnetoresistance originates from the spin polarization of Mn<sub>3</sub>Pt in the momentum space. All-antiferromagnetic tunnel junction devices, with nearly vanishing stray fields and strongly enhanced spin dynamics up to the terahertz level, could be important for next-generation highly integrated and ultrafast memory devices<sup>7,9,16</sup>.

**Full text:** <https://www.nature.com/articles/s41586-022-05461-y>

### **Autonomous self-burying seed carriers for aerial seeding**

*Danli Luo, Aditi Maheshwari, Andreea Danielescu, et al.*

#### **Abstract**

Aerial seeding can quickly cover large and physically inaccessible areas<sup>1</sup> to improve soil quality and scavenge residual nitrogen in agriculture<sup>2</sup>, and for postfire reforestation<sup>3,4,5</sup> and wildland restoration<sup>6,7</sup>. However, it suffers from low germination rates, due to the direct exposure of unburied seeds to harsh sunlight, wind and granivorous birds, as well as undesirable air humidity and temperature<sup>1,8,9</sup>. Here, inspired by *Erodium* seeds<sup>10,11,12,13,14</sup>, we design and fabricate self-drilling seed carriers,

turning wood veneer into highly stiff (about 4.9 GPa when dry, and about 1.3 GPa when wet) and hygromorphic bending or coiling actuators with an extremely large bending curvature ( $1,854\text{ m}^{-1}$ ), 45 times larger than the values in the literature<sup>15,16,17,18</sup>. Our three-tailed carrier has an 80% drilling success rate on flat land after two triggering cycles, due to the beneficial resting angle ( $25^\circ$ – $30^\circ$ ) of its tail anchoring, whereas the natural *Erodium* seed's success rate is 0%. Our carriers can carry payloads of various sizes and contents including biofertilizers and plant seeds as large as those of whitebark pine, which are about 11 mm in length and about 72 mg. We compare data from experiments and numerical simulation to elucidate the curvature transformation and actuation mechanisms to guide the design and optimization of the seed carriers. Our system will improve the effectiveness of aerial seeding to relieve agricultural and environmental stresses, and has potential applications in energy harvesting, soft robotics and sustainable buildings.

**Full text:** <https://www.nature.com/articles/s41586-022-05656-3>

## Realization of a minimal Kitaev chain in coupled quantum dots

*Tom Dvir, Guanzhong Wang, Nick van Loo, et al.*

### Abstract

Majorana bound states constitute one of the simplest examples of emergent non-Abelian excitations in condensed matter physics. A toy model proposed by Kitaev shows that such states can arise at the ends of a spinless p-wave superconducting chain<sup>1</sup>. Practical proposals for its realization<sup>2,3</sup> require coupling neighbouring quantum dots (QDs) in a chain through both electron tunnelling and crossed Andreev reflection<sup>4</sup>. Although both processes have been observed in semiconducting nanowires and carbon nanotubes<sup>5,6,7,8</sup>, crossed-Andreev interaction was neither easily tunable nor strong enough to induce coherent hybridization of dot states. Here we demonstrate the simultaneous presence of all necessary ingredients for an artificial Kitaev chain: two spin-polarized QDs in an InSb nanowire strongly coupled by both elastic co-tunnelling (ECT) and crossed Andreev reflection (CAR). We fine-tune this system to a sweet spot where a pair of poor man's Majorana states is predicted to appear. At this sweet spot, the transport characteristics satisfy the theoretical predictions for such a system, including pairwise correlation, zero charge and stability against local perturbations. Although the simple system presented here can be scaled to simulate a full Kitaev chain with an emergent topological order, it can also be used imminently to explore relevant physics related to non-Abelian anyons.

**Full text:** <https://www.nature.com/articles/s41586-022-05585-1>



## MATERIALS

### **Magnetically mediated hole pairing in fermionic ladders of ultracold atoms**

*Sarah Hirthe, Thomas Chalopin, Dominik Bourgund, et al.*

#### **Abstract**

Conventional superconductivity emerges from pairing of charge carriers—electrons or holes—mediated by phonons<sup>1</sup>. In many unconventional superconductors, the pairing mechanism is conjectured to be mediated by magnetic correlations<sup>2</sup>, as captured by models of mobile charges in doped antiferromagnets<sup>3</sup>. However, a precise understanding of the underlying mechanism in real materials is still lacking and has been driving experimental and theoretical research for the past 40 years. Early theoretical studies predicted magnetic-mediated pairing of dopants in ladder systems<sup>4,5,6,7,8</sup>, in which idealized theoretical toy models explained how pairing can emerge despite repulsive interactions<sup>9</sup>. Here we experimentally observe this long-standing theoretical prediction, reporting hole pairing due to magnetic correlations in a quantum gas of ultracold atoms. By engineering doped antiferromagnetic ladders with mixed-dimensional couplings<sup>10</sup>, we suppress Pauli blocking of holes at short length scales. This results in a marked increase in binding energy and decrease in pair size, enabling us to observe pairs of holes predominantly occupying the same rung of the ladder. We find a hole–hole binding energy of the order of the superexchange energy and, upon increased doping, we observe spatial structures in the pair distribution, indicating repulsion between bound hole pairs. By engineering a configuration in which binding is strongly enhanced, we delineate a strategy to increase the critical temperature for superconductivity.

**Full text:** <https://www.nature.com/articles/s41586-022-05437-y>

### **Non-epitaxial single-crystal 2D material growth by geometric confinement**

*Ki Seok Kim, Doyoon Lee, Celesta S, et al.*

#### **Abstract**

Two-dimensional (2D) materials and their heterostructures show a promising path for next-generation electronics<sup>1,2,3</sup>. Nevertheless, 2D-based electronics have not been commercialized, owing mainly to three critical challenges: i) precise kinetic control of layer-by-layer 2D material growth, ii) maintaining a single domain during the growth, and iii) wafer-scale controllability of layer numbers and crystallinity. Here we introduce a deterministic, confined-growth technique that can tackle these three issues simultaneously, thus obtaining wafer-scale single-domain 2D monolayer arrays and their heterostructures on arbitrary substrates. We geometrically confine the growth of

the first set of nuclei by defining a selective growth area via patterning SiO<sub>2</sub> masks on two-inch substrates. Owing to substantial reduction of the growth duration at the micrometre-scale SiO<sub>2</sub> trenches, we obtain wafer-scale single-domain monolayer WSe<sub>2</sub> arrays on the arbitrary substrates by filling the trenches via short growth of the first set of nuclei, before the second set of nuclei is introduced, thus without requiring epitaxial seeding. Further growth of transition metal dichalcogenides with the same principle yields the formation of single-domain MoS<sub>2</sub>/WSe<sub>2</sub> heterostructures. Our achievement will lay a strong foundation for 2D materials to fit into industrial settings.

**Full text:** <https://www.nature.com/articles/s41586-022-05524-0>

## Approaching the quantum limit in two-dimensional semiconductor contacts

*Weisheng Li, Xiaoshu Gong, Zhihao Yu, et al.*

### Abstract

The development of next-generation electronics requires scaling of channel material thickness down to the two-dimensional limit while maintaining ultralow contact resistance<sup>1,2</sup>. Transition-metal dichalcogenides can sustain transistor scaling to the end of roadmap, but despite a myriad of efforts, the device performance remains contact-limited<sup>3,4,5,6,7,8,9,10,11,12</sup>. In particular, the contact resistance has not surpassed that of covalently bonded metal–semiconductor junctions owing to the intrinsic van der Waals gap, and the best contact technologies are facing stability issues<sup>3,7</sup>. Here we push the electrical contact of monolayer molybdenum disulfide close to the quantum limit by hybridization of energy bands with semi-metallic antimony (Sb) through strong van der Waals interactions. The contacts exhibit a low contact resistance of 42 ohm micrometres and excellent stability at 125 degrees Celsius. Owing to improved contacts, short-channel molybdenum disulfide transistors show current saturation under one-volt drain bias with an on-state current of 1.23 milliamperes per micrometre, an on/off ratio over 10<sup>8</sup> and an intrinsic delay of 74 femtoseconds. These performances outperformed equivalent silicon complementary metal–oxide–semiconductor technologies and satisfied the 2028 roadmap target. We further fabricate large-area device arrays and demonstrate low variability in contact resistance, threshold voltage, subthreshold swing, on/off ratio, on-state current and transconductance<sup>13</sup>. The excellent electrical performance, stability and variability make antimony (Sb) a promising contact technology for transition-metal-dichalcogenide-based electronics beyond silicon.

**Full text:** <https://www.nature.com/articles/s41586-022-05431-4>

## Vertical organic electrochemical transistors for complementary circuits

*Wei Huang, Jianhua Chen, Yao Yao, et al.*

### Abstract

Organic electrochemical transistors (OECTs) and OECT-based circuitry offer great potential in bioelectronics, wearable electronics and artificial neuromorphic electronics because of their exceptionally low driving voltages ( $<1$  V), low power consumption ( $<1$   $\mu$ W), high transconductances ( $>10$  mS) and biocompatibility<sup>1,2,3,4,5</sup>. However, the successful realization of critical complementary logic OECTs is currently limited by temporal and/or operational instability, slow redox processes and/or switching, incompatibility with high-density monolithic integration and inferior n-type OECT performance<sup>6,7,8</sup>. Here we demonstrate p- and n-type vertical OECTs with balanced and ultra-high performance by blending redox-active semiconducting polymers with a redox-inactive photocurable and/or photopatternable polymer to form an ion-permeable semiconducting channel, implemented in a simple, scalable vertical architecture that has a dense, impermeable top contact. Footprint current densities exceeding  $1$   $\text{kA cm}^{-2}$  at less than  $\pm 0.7$  V, transconductances of  $0.2$ – $0.4$  S, short transient times of less than  $1$  ms and ultra-stable switching ( $>50,000$  cycles) are achieved in, to our knowledge, the first vertically stacked complementary vertical OECT logic circuits. This architecture opens many possibilities for fundamental studies of organic semiconductor redox chemistry and physics in nanoscopically confined spaces, without macroscopic electrolyte contact, as well as wearable and implantable device applications.

**Full text:** <https://www.nature.com/articles/s41586-022-05592-2>

## A strained ring for stereoselective synthesis

*Christian L Jankovic, F G West*

### Abstract

Effective chemical synthesis of a complex natural product in a laboratory flask requires careful planning so that the smallest possible number of reaction steps is used and they all occur at high chemical yields. These efforts can be thwarted when key strategic steps (forming important chemical bonds or establishing stereogenic centers) are unselective—that is, they furnish undesired reaction products instead of or in addition to the one needed to complete the synthetic sequence. To overcome these challenges, new types of transformations are sought that proceed with high selectivity under the mildest possible conditions. On page 261 of this issue, Ippoliti et al. (1) describe the

use of a new class of reactive intermediates, cyclic allenes, in the enantioselective synthesis of the alkaloid lissodendoric acid A. This synthesis highlights how cyclic allene chemistry can work in tandem with other methods to obtain daunting products in a selective fashion.

**Full text:** <https://www.science.org/doi/10.1126/science.ade7122>

## **Dynamic kinetic asymmetric arylation and alkenylation of ketones**

*Lin-Xin Ruan, Bo Sun, Jia-Ming Liu, et al.*

### **Abstract**

Despite the importance of enantioenriched alcohols in medicinal chemistry, total synthesis, and materials science, the efficient and selective construction of enantioenriched tertiary alcohols bearing two contiguous stereocenters has remained a substantial challenge. We report a platform for their preparation through the enantioconvergent, nickel-catalyzed addition of organoboronates to racemic, nonactivated ketones. We prepared several important classes of  $\alpha,\beta$ -chiral tertiary alcohols in a single step with high levels of diastereo- and enantioselectivity through a dynamic kinetic asymmetric addition of aryl and alkenyl nucleophiles. We applied this protocol to modify several profen drugs and to rapidly synthesize biologically relevant molecules. We expect this nickel-catalyzed, base-free ketone racemization process to be a widely applicable strategy for the development of dynamic kinetic processes.

**Full text:** <https://www.science.org/doi/10.1126/science.ade0760>

## **BIOLOGY**

### **De novo design of modular peptide-binding proteins by superhelical matching**

*Kejia Wu, Hua Bai, Ya-Ting Chang, et al.*

### **Abstract**

General approaches for designing sequence-specific peptide-binding proteins would have wide utility in proteomics and synthetic biology. However, designing peptide-binding proteins is challenging, as most peptides do not have defined structures in isolation, and hydrogen bonds must be made to the buried polar groups in the peptide backbone<sup>1,2,3</sup>. Here, inspired by natural and re-engineered protein-peptide systems<sup>4,5,6,7,8,9,10,11</sup>, we set out to design proteins made out of repeating units that bind

peptides with repeating sequences, with a one-to-one correspondence between the repeat units of the protein and those of the peptide. We use geometric hashing to identify protein backbones and peptide-docking arrangements that are compatible with bidentate hydrogen bonds between the side chains of the protein and the peptide backbone<sup>12</sup>. The remainder of the protein sequence is then optimized for folding and peptide binding. We design repeat proteins to bind to six different tripeptide-repeat sequences in polyproline II conformations. The proteins are hyperstable and bind to four to six tandem repeats of their tripeptide targets with nanomolar to picomolar affinities in vitro and in living cells. Crystal structures reveal repeating interactions between protein and peptide interactions as designed, including ladders of hydrogen bonds from protein side chains to peptide backbones. By redesigning the binding interfaces of individual repeat units, specificity can be achieved for non-repeating peptide sequences and for disordered regions of native proteins.

**Full text:** <https://www.nature.com/articles/s41586-023-05909-9>

## **Spatial epigenome–transcriptome co-profiling of mammalian tissues**

*Di Zhang, Yanxiang Deng, Petra Kukanja, et al.*

### **Abstract**

Emerging spatial technologies, including spatial transcriptomics and spatial epigenomics, are becoming powerful tools for profiling of cellular states in the tissue context<sup>1,2,3,4,5</sup>. However, current methods capture only one layer of omics information at a time, precluding the possibility of examining the mechanistic relationship across the central dogma of molecular biology. Here, we present two technologies for spatially resolved, genome-wide, joint profiling of the epigenome and transcriptome by cosequencing chromatin accessibility and gene expression, or histone modifications (H3K27me3, H3K27ac or H3K4me3) and gene expression on the same tissue section at near-single-cell resolution. These were applied to embryonic and juvenile mouse brain, as well as adult human brain, to map how epigenetic mechanisms control transcriptional phenotype and cell dynamics in tissue. Although highly concordant tissue features were identified by either spatial epigenome or spatial transcriptome we also observed distinct patterns, suggesting their differential roles in defining cell states. Linking epigenome to transcriptome pixel by pixel allows the uncovering of new insights in spatial epigenetic priming, differentiation and gene regulation within the tissue architecture. These technologies are of great interest in life science and biomedical research.

**Full text:** <https://www.nature.com/articles/s41586-023-05795-1>

## Visualizing the disordered nuclear transport machinery in situ

*Miao Yu, Maziar Heidari, Sofya Mikhaleva, et al.*

### Abstract

The approximately 120 MDa mammalian nuclear pore complex (NPC) acts as a gatekeeper for the transport between the nucleus and cytosol<sup>1</sup>. The central channel of the NPC is filled with hundreds of intrinsically disordered proteins (IDPs) called FG-nucleoporins (FG-NUPs)<sup>2,3</sup>. Although the structure of the NPC scaffold has been resolved in remarkable detail, the actual transport machinery built up by FG-NUPs—about 50 MDa—is depicted as an approximately 60-nm hole in even highly resolved tomograms and/or structures computed with artificial intelligence<sup>4,5,6,7,8,9,10,11</sup>. Here we directly probed conformations of the vital FG-NUP98 inside NPCs in live cells and in permeabilized cells with an intact transport machinery by using a synthetic biology-enabled site-specific small-molecule labelling approach paired with highly time-resolved fluorescence microscopy. Single permeabilized cell measurements of the distance distribution of FG-NUP98 segments combined with coarse-grained molecular simulations of the NPC allowed us to map the uncharted molecular environment inside the nanosized transport channel. We determined that the channel provides—in the terminology of the Flory polymer theory<sup>12</sup>—a ‘good solvent’ environment. This enables the FG domain to adopt expanded conformations and thus control transport between the nucleus and cytoplasm. With more than 30% of the proteome being formed from IDPs, our study opens a window into resolving disorder–function relationships of IDPs in situ, which are important in various processes, such as cellular signalling, phase separation, ageing and viral entry.

**Full text:** <https://www.nature.com/articles/s41586-023-05990-0>

# III Calling for papers

## ICMMCEM 2023

**Submission deadline:** Aug 3, 2023  
**Conference date:** Aug 13, 2023  
**Full name:** 2023 International Conference on Machinery Manufacturing, Control Engineering and Mechanics  
**Location:** Zhengzhou, China  
**Website:** <http://www.icmmcem.org/>

2023 International Conference on Machinery Manufacturing, Control Engineering and Mechanics will be held in Zhengzhou, China . The purpose and purpose of icmmcem is to introduce the latest research and achievements of scientists in mechanical, automotive and material engineering related fields. This meeting provides an opportunity for delegates to exchange new ideas and applications through face-to-face discussions, establish business or research relationships, and find global partners for future cooperation.

All full paper submissions to the ICMMCEM 2023 could be written in English and will be sent to at least two reviewers and evaluated based on originality, technical or research content or depth, correctness, relevance to conference, contributions, and readability. All accepted papers of ICMMCEM 2023 will be published in the conference proceedings, which will be submitted to EI Compendex, Scopus for indexing.

### Topics

- Machine Vision
- Sensor Technology
- Measure Control Technologies and Intelligent Systems
- Transmission and Control of Fluid
- Mechanical Control and Information Processing Technology
- Embedded System
- Advanced Forming Manufacturing and Equipment
- NEMS/MEMS Technology and Equipment
- Micro-Electronic Packaging Technology and Equipment
- Advanced NC Techniques and Equipment
- Power and Fluid Machinery
- Energy Machinery and Equipment
- Construction Machinery and Equipment
- Mechatronics

- Industrial Robotics and Automation
- Adaptive control
- Robust control
- Process control
- Complex systems
- Co-operative control
- Identification and estimation
- Nonlinear systems
- Intelligent systems
- Discrete event systems
- Hybrid systems
- Networked control systems
- Sensor network systems
- Delay systems
- Neural networks
- Fuzzy systems
- Control of biological systems
- Precision motion control
- Control applications
- Control engineering education
- Physical mechanics
- Computational mechanics
- Structural dynamics
- Solid mechanics
- Fluid mechanics
- Thermodynamics
- Celestial Mechanics
- Environmental mechanics
- Elastic mechanics
- Anthropology
- Aerodynamics
- Vibration
- Mechanics of materials
- Fatigue and Fracture Mechanics



# ICMSC 2023

**Submission deadline:** June 24, 2023  
**Conference date:** June 24- June 25, 2023  
**Full name:** The 2023 5th International Conference on Mechanics, Simulation and Control  
**Location:** San Jose, USA  
**Website:** <http://www.msconf.org/>

The 2023 5th International Conference on Mechanics, Simulation and Control (ICMSC 2023) will be held during June 24-25, 2023 in San Jose, USA. ICMSC 2023 aims to bring together academic scientists, leading engineers, industry researchers and scholar students to exchange and share their experiences and research results about all aspects of mechanical engineering, applied mechanics, computer simulation, mathematical modeling, intelligent computing, automation and control engineering, and will discuss the practical challenges encountered and the solutions adopted.

The conference provided delegates with the opportunity to meet face-to-face with new ideas and application experiences, build business or research relationships, and find global partners for future collaboration. We sincerely invite all researchers, scholars, engineers, students and people to be interested in these areas and participate in ICMSC. The conference committee welcomes your participation and immediately delivers the paper through the official email address.

## Topics:

### Mechanical Engineering and Mechanics

- The Basic of Mechanics and Research Methods
- Dynamics and Vibration
- Solid Mechanics
- Fluid Mechanics
- Thermodynamics
- Biomechanics
- Environmental Mechanics
- Acoustics and Noise Control
- Aerodynamics
- Applied Mechanics
- Automation, Mechatronics and Robotics
- Automobiles
- Automotive Engineering
- ...

## Computer Simulation Modeling

- Simulation Tools and Languages
- Discrete Event Simulation
- Object-Oriented Implementation
- Web-based Simulation
- Monte Carlo Simulation
- Distributed Simulation
- Simulation Optimization
- Numerical Methods
- Mathematical Modelling
- Agent-based Modelling
- Dynamic Modelling
- Continuous and Discrete Methodologies
- Time Series Analysis
- ...

## Automation and Control Engineering

- Adaptive Control
- Automated Guided Vehicles
- Biomedical Engineering and Biosystems
- Automation
- Control Education
- Control Theory and Application
- Discrete Event Systems
- Estimation and Identification
- Factory Modeling and Automation
- Fault Detection
- Flexible Manufacturing Systems
- Fuzzy and Neural Systems
- Industrial Process Control
- Instruments and Vibration Control
- Integrated Manufacturing
- ...

# ICEMGD 2023

**Submission deadline:** July 31, 2023  
**Conference date:** August 6, 2023  
**Full name:** The 7th International Conference on Economic Management and Green Development  
**Location:** Sydney, Australia; Oxford, UK; Birmingham, UK; London, UK; Beijing, China  
**Website:** <https://www.icemgd.org/>

The 7th International Conference on Economic Management and Green Development (ICEMGD 2023) will be held on August 6, 2023. The aim of ICEMGD is to provide a platform for educators, scholars, managers, and graduate students from different cultural backgrounds to present and discuss research, developments, and innovations in their academic fields. It provides opportunities for the attendees to exchange new ideas and application experiences, establish business or research relations, and look for global partners for future collaborations.

To break the barriers of time and space and to provide seamless communication opportunities for worldwide scholars, ICEMGD 2023 will be organized distributedly with dispersed venues. Transnational academic workshops are the co-organisers of ICEMGD 2023 and are held at King's College London (London, UK), Birmingham City University (Birmingham, UK), UNSW Business School (Sydney, Australia), and Peking University (Beijing, China). Besides these workshops, ICEMGD 2023 also holds an online session and welcomes participants from all countries and regions.

All full paper submissions to the ICEMGD should be written in English. They will be sent to the committee and reviewed by at least two editors. All papers will be evaluated based on originality, technicality, research depth, accuracy, relevance to the conference, academic contributions, and readability.

## Topics

All submitted articles should report original, previously unpublished research results, experimental or theoretical. The discussion topics and submission topics of the International Conference on Economic Management and Green Development (ICEMGD) include but are not limited to the following:

### Finance and Economics

- Accounting
- Financial Economics
- International Trade
- Marketing Theory and Applications
- Regional Economic Growth
- Welfare Economics

- Constitutional Economics
- Econometrics
- Financial Sustainability
- International Finance
- Labor Economics
- Market Structure and Pricing
- Public Economics
- Regulatory Economics
- Digital Financial Intermediation
- Finance & Investment
- Financial Risks and Capital Flows
- Prices, Business Fluctuations, and Cycles

## Business Management

- Business Intelligence
- Business Statistics
- Consumer Behavior
- Cost Management
- Decision Making
- Governance and Sustainability
- Human Resource Management
- Organizational Design, Modeling and Simulation
- Product Management
- Administrative Management
- Business Performance Management
- Corporate Finance and Governance
- Human Development
- Strategy Implementation and Control
- Technology and Innovation

## Public Administration

- Crisis Management
- Internet Governance
- Policy Analysis
- Political Ethics
- Social Governance
- Intergovernmental Relations
- Organizational Theory
- Public Budgeting
- Public Service
- Non-Governmental Organizations

## Green Development

- Advanced Green Energy Technologies

- Climate Change and Global Warming
- Energy Management Technology
- Environmental and Pollution Control
- Environmental-Friendly Materials
- Sustainability Engineering
- Low Carbon Economy
- Sustainable Development
- Circular Economy
- Ecology and Biodiversity Conservation
- Energy Efficiency
- Environmental Policy
- Green Manufacturing and Building
- Integrated Energy Systems
- Recycling Technology
- Sustainable Communities

# PESE 2023

**Submission deadline:** Jun 30, 2023  
**Conference date:** Oct 24, 2023 - Oct 26, 2023  
**Full name:** EAI International Conference on POWER ENGINEERING and SUSTAINABLE ENERGY  
**Location:** Bratislava, Slovakia  
**Website:** <https://pese-conference.eai-conferences.org/>

The growth and development of populations worldwide led to an increase in the consumption of energy resources, raising serious sustainability issues. In this context, Power Engineering is assuming a crucial importance in numerous aspects regarding the efficiency and effectivity of power generation, transmission, and distribution, as well as from the perspective of the utilization of electrical apparatus by the end users. In addition, the significance of Power Engineering is also decisive for the paradigm of decentralized energy resources. Therefore, new technologies are emerging, especially for the successful operation of future Smart Grids and Smart Cities, encompassed with the production and utilization of Sustainable Energy.

## Topics

We welcome contributions from the following fields:

- Electrical and Mechanical Engineering Systems.
- Industrial Electronics Technologies and Applications.
- Power System Stability and Reliability; Power System Protection.
- Distributed Power Management; Demand Response; Power System Modelling and Simulation.
- Power Electronics Technologies and Applications.
- HVAC and HVDC Power Transmission and Distribution.
- Renewable Energy and Storage Systems.
- Smart Grids and Smart Homes; On-Grid and Off-Grid Technologies.
- Electric Mobility; Innovative Transportation Systems; Electric Railway Systems.
- Communication Networks.
- Environmental Sustainability; Sustainable Energy