

# 图书情报专题研究

最新学科研究热点与前沿

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# 前 言

《图书情报专题研究》的宗旨是为我校师生开展学术研究提供有价值的参考信息，此项工作由图书馆信息咨询服务部承担。“最新学科研究热点与前沿”根据学校所购买的数字资源，通过分析其深层次的功能，从数据库中组织整理出了与我校学科领域相关的最新学科热点研究论文、最新研究前沿及最新国际会议信息等，以期能对我校师生开展学术研究、项目立项、开题等学术研究活动提供帮助。

本期收集整理了如下七个方面的热点文献和前沿信息：

1、Nature Latest Research, Nature Materials 最新研究进展；

2、IEL Top25, IEL 数据库下载最多的 25 篇论文；

3、ESI (Essential Science Indicators) HOT PAPERS, 按照 ESI 某一学科热点论文被引频次排名选取前 25 篇；

4、ESI (Essential Science Indicators) HIGHLY CITED PAPERS, 按照 ESI 某一学科高被引论文被引频次排名选取前 25 篇；

5、AIAA、IAF 最新会议，由 AIAA、IAF 主站提供的最新会议信息，可供相关研究者参考；

6、ACM 最新会议，根据 ACM 主页所提供的最新会议信息整理所得，可供相关研究者参考；

7、IQPC 最新会议，由国际质量与竞争力中心 (IQPC: International Quality and Productivity Center) 提供的最新国际会议，内容涉及国防、能源、工业、科技、电信等领域。IQPC 是国际顶级的会议展览策划公司，于 1973 年成立于美国，旨在为全球业务主管提供量身定制的会议、大型会展以及培训课程，积极为行业人士的相互交流创建平台，使业内人士能够随时掌握行业发展的最新趋势及技术创新。

如果您对我们的栏目设置、内容编排等有好的意见和建议，欢迎与我们联系 (电话：88492928)，我们将积极采纳，使这份电子刊物日臻完善，共同为把我校建成学科特色鲜明的世界一流大学而努力。

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## *Nature Latest Research (Materials)*

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来源: <https://www.nature.com/nmat/>

1. 标题: An integrated optical modulator operating at cryogenic temperatures

作者: Felix Eltes, Gerardo E. Villarreal-Garcia, Daniele Caimi, Heinz Siegwart, Antonio A. Gentile, Andy Hart, Pascal Stark, Graham D. Marshall, Mark G. Thompson, Jorge Barreto, Jean Fompeyrine & Stefan Abel

摘要: Photonic integrated circuits (PICs) operating at cryogenic temperatures are fundamental building blocks required to achieve scalable quantum computing and cryogenic computing technologies<sup>1,2</sup>. Silicon PICs have matured for room-temperature applications, but their cryogenic performance is limited by the absence of efficient low-temperature electro-optic modulation. Here we demonstrate electro-optic switching and modulation from room temperature down to 4 K by using the Pockels effect in integrated barium titanate (BaTiO<sub>3</sub>) devices<sup>3</sup>. We investigate the temperature dependence of the nonlinear optical properties of BaTiO<sub>3</sub>, showing an effective Pockels coefficient of 200 pm V<sup>-1</sup> at 4 K. The fabricated devices show an electro-optic bandwidth of 30 GHz, ultralow-power tuning that is 109 times more efficient than thermal tuning, and high-speed data modulation at 20 Gbps. Our results demonstrate a missing component for cryogenic PICs, removing major roadblocks for the realization of cryogenic-compatible systems in the field of quantum computing, supercomputing and sensing, and for interfacing those systems with instrumentation at room temperature.

链接: <https://www.nature.com/articles/s41563-020-0725-5>

2. 标题: Ultrastable monodisperse polymer glass formed by physical vapour deposition

作者: Adam N. Raegen, Junjie Yin, Qi Zhou & James A. Forrest

摘要: Stable glasses prepared by vapour deposition are an analogue of glassy materials aged for geological timescales. The ability to prepare such materials allows the study of near-ideal glassy systems. We report the preparation and characterization of stable glasses of polymers prepared by physical vapour deposition. By controlling the substrate temperature, deposition rate and polydispersity, we prepared and characterized a variety of stable polymer glasses. These materials display the kinetic stability, low fictive temperatures and high-density characteristic of stable glasses. Extrapolation of the measured transformation times between the stable and normal glass provides estimates of the relaxation times of the equilibrium supercooled liquid at temperatures as much as 30 K below the glass transition temperature. These results demonstrate that polymer stable glasses are an exciting and powerful tool in the study of ultrastable glass and disordered materials in general.

链接: <https://www.nature.com/articles/s41563-020-0723-7>



3.标题: Semimetals for high-performance photodetection

作者: Jing Liu, Fengnian Xia, Di Xiao, F. Javier García de Abajo & Dong Sun

摘要: Semimetals are being explored for their unique advantages in low-energy high-speed photodetection, although they suffer from serious drawbacks such as an intrinsically high dark current. In this Perspective, we envision the exploitation of topological effects in the photoresponse of these materials as a promising route to circumvent these problems. We overview recent studies on photodetection based on graphene and other semimetals, and further discuss the opportunities created by topological effects, along with the additional challenges that they impose on photodetector designs.

链接: <https://www.nature.com/articles/s41563-020-0715-7>

4.标题: Evidence of higher-order topology in multilayer WTe<sub>2</sub> from Josephson coupling through anisotropic hinge states

作者: Yong-Bin Choi, Yingming Xie, Chui-Zhen Chen, Jinho Park, Su-Beom Song, Jiho Yoon, B. J. Kim, Takashi Taniguchi, Kenji Watanabe, Jonghwan Kim, Kin Chung Fong, Mazhar N. Ali, Kam Tuen Law & Gil-Ho Lee

摘要: Td-WTe<sub>2</sub> (non-centrosymmetric and orthorhombic), a type-II Weyl semimetal, is expected to have higher-order topological phases with topologically protected, helical one-dimensional hinge states when its Weyl points are annihilated. However, the detection of these hinge states is difficult due to the semimetallic behaviour of the bulk. In this study, we have spatially resolved the hinge states by analysing the magnetic field interference of the supercurrent in Nb–WTe<sub>2</sub>–Nb proximity Josephson junctions. The Josephson current along the a axis of the WTe<sub>2</sub> crystal, but not along the b axis, showed a sharp enhancement at the edges of the junction, and the amount of enhanced Josephson current was comparable to the upper limits of a single one-dimensional helical channel. Our experimental observations suggest a higher-order topological phase in WTe<sub>2</sub> and its corresponding anisotropic topological hinge states, in agreement with theoretical calculations. Our work paves the way for the study of hinge states in topological transition-metal dichalcogenides and analogous phases.

链接: <https://www.nature.com/articles/s41563-020-0721-9>

5.标题: Chirality-induced relaxor properties in ferroelectric polymers

作者: Yang Liu, Bing Zhang, Wenhan Xu, Aziguli Haibibu, Zhubing Han, Wenchang Lu, J. Bernholc & Qing Wang

摘要: Relaxor ferroelectrics exhibit outstanding dielectric, electromechanical and electrocaloric properties, and are the materials of choice for acoustic sensors, solid-state coolers, transducers and actuators<sup>1,2,3,4</sup>. Despite more than five decades of intensive study, relaxor ferroelectrics remain one of the least understood material families in ferroelectric materials and condensed matter physics<sup>5,6,7,8,9,10,11,12,13,14</sup>. Here, by combining X-ray diffraction, atomic force microscope infrared spectroscopy and first-principles calculations, we reveal that the relaxor behaviour of ferroelectric polymers originates from conformational disorder, completely different from classic perovskite relaxors, which are typically characterized by chemical disorder. We show that chain chirality is essential to the formation of the disordered helix conformation arising from local distortions of gauche torsional angles, which consequently give rise to relaxor properties in polymers. This study not only sheds light on the fundamental mechanisms of relaxor ferroelectrics, but also



offers guidance for the discovery of new ferroelectric relaxor organic materials for flexible, scalable and biocompatible sensor and energy applications.

链接: <https://www.nature.com/articles/s41563-020-0724-6>

6. 标题: Distinct handedness of spin wave across the compensation temperatures of ferrimagnets

作者: Changsoo Kim, Soogil Lee, Hyun-Gyu Kim, Ji-Ho Park, Kyung-Woong Moon, Jae Yeol Park, Jong Min Yuk, Kyung-Jin Lee, Byong-Guk Park, Se Kwon Kim, Kab-Jin Kim & Chanyong Hwang

摘要: Antiferromagnetic spin waves have been predicted to offer substantial functionalities for magnonic applications due to the existence of two distinct polarizations, the right-handed and left-handed modes, as well as their ultrafast dynamics. However, experimental investigations have been hampered by the field-immunity of antiferromagnets. Ferrimagnets have been shown to be an alternative platform to study antiferromagnetic spin dynamics. Here we investigate thermally excited spin waves in ferrimagnets across the magnetization compensation and angular momentum compensation temperatures using Brillouin light scattering. Our results show that right-handed and left-handed modes intersect at the angular momentum compensation temperature where pure antiferromagnetic spin waves are expected. A field-induced shift of the mode-crossing point from the angular momentum compensation temperature and the gyromagnetic reversal reveal hitherto unrecognized properties of ferrimagnetic dynamics. We also provide a theoretical understanding of our experimental results. Our work demonstrates important aspects of the physics of ferrimagnetic spin waves and opens up the attractive possibility of ferrimagnet-based magnonic devices.

链接: <https://www.nature.com/articles/s41563-020-0722-8>

7. 标题: Exchange magnetostriction in two-dimensional antiferromagnets

作者: Shengwei Jiang, Hongchao Xie, Jie Shan & Kin Fai Mak

摘要: Magnetostriction, coupling between the mechanical and magnetic degrees of freedom, finds a variety of applications in magnetic actuation, transduction and sensing<sup>1,2</sup>. The discovery of two-dimensional layered magnetic materials<sup>3,4,5,6,7,8</sup> presents a new platform to explore the magnetostriction effects in ultrathin solids. Here we demonstrate an exchange-driven magnetostriction effect in mechanical resonators made of two-dimensional antiferromagnetic CrI<sub>3</sub>. The mechanical resonance frequency is found to depend on the magnetic state of the material. We quantify the relative importance of the exchange and anisotropy magnetostriction by measuring the resonance frequency under a magnetic field parallel and perpendicular to the easy axis, respectively. Furthermore, we show efficient strain-tuning of the internal magnetic interactions in two-dimensional CrI<sub>3</sub> as a result of inverse magnetostriction. Our results establish the basis for mechanical detection and control of magnetic states and magnetic phase transitions in two-dimensional layered materials.

链接: <https://www.nature.com/articles/s41563-020-0712-x>

8. 标题: Correlated electronic phases in twisted bilayer transition metal dichalcogenides

作者: Lei Wang, En-Min Shih, Augusto Ghiotto, Lede Xian, Daniel A. Rhodes, Cheng Tan, Martin Claassen, Dante M. Kennes, Yusong Bai, Bumho Kim, Kenji Watanabe, Takashi Taniguchi, Xiaoyang Zhu, James Hone, Angel Rubio, Abhay N. Pasupathy & Cory R. Dean

摘要: In narrow electron bands in which the Coulomb interaction energy becomes comparable to the bandwidth, interactions can drive new quantum phases. Such flat bands in twisted graphene-based

systems result in correlated insulator, superconducting and topological states. Here we report evidence of low-energy flat bands in twisted bilayer WSe<sub>2</sub>, with signatures of collective phases observed over twist angles that range from 4 to 5.1°. At half-band filling, a correlated insulator appeared that is tunable with both twist angle and displacement field. At a 5.1° twist, zero-resistance pockets were observed on doping away from half filling at temperatures below 3 K, which indicates a possible transition to a superconducting state. The observation of tunable collective phases in a simple band, which hosts only two holes per unit cell at full filling, establishes twisted bilayer transition metal dichalcogenides as an ideal platform to study correlated physics in two dimensions on a triangular lattice.

链接: <https://www.nature.com/articles/s41563-020-0708-6>

9.标题: Gate-tunable spin waves in antiferromagnetic atomic bilayers

作者: Xiao-Xiao Zhang, Lizhong Li, Daniel Weber, Joshua Goldberger, Kin Fai Mak & Jie Shan

摘要: Remarkable properties of two-dimensional (2D) layer magnetic materials, which include spin filtering in magnetic tunnel junctions and the gate control of magnetic states, were demonstrated recently<sup>1,2,3,4,5,6,7,8,9,10,11,12</sup>. Whereas these studies focused on static properties, dynamic magnetic properties, such as excitation and control of spin waves, remain elusive. Here we investigate spin-wave dynamics in antiferromagnetic CrI<sub>3</sub> bilayers using an ultrafast optical pump/magneto-optical Kerr probe technique. Monolayer WSe<sub>2</sub> with a strong excitonic resonance was introduced on CrI<sub>3</sub> to enhance the optical excitation of spin waves. We identified subterahertz magnetic resonances under an in-plane magnetic field, from which the anisotropy and interlayer exchange fields were determined. We further showed tuning of the antiferromagnetic resonances by tens of gigahertz through electrostatic gating. Our results shed light on magnetic excitations and spin dynamics in 2D magnetic materials, and demonstrate their potential for applications in ultrafast data storage and processing.

链接: <https://www.nature.com/articles/s41563-020-0713-9>

10.标题: Supramolecular-covalent hybrid polymers for light-activated mechanical actuation

作者: Chuang Li, Aysenur Iscen, Hiroaki Sai, Kohei Sato, Nicholas A. Sather, Stacey M. Chin, Zaida Álvarez, Liam C. Palmer, George C. Schatz & Samuel I. Stupp

摘要: The development of synthetic structures that mimic mechanical actuation in living matter such as autonomous translation and shape changes remains a grand challenge for materials science. In living systems the integration of supramolecular structures and covalent polymers contributes to the responsive behaviour of membranes, muscles and tendons, among others. Here we describe hybrid light-responsive soft materials composed of peptide amphiphile supramolecular polymers chemically bonded to spiropyran-based networks that expel water in response to visible light. The supramolecular polymers form a reversibly deformable and water-draining skeleton that mechanically reinforces the hybrid and can also be aligned by printing methods. The noncovalent skeleton embedded in the network thus enables faster bending and flattening actuation of objects, as well as longer steps during the light-driven crawling motion of macroscopic films. Our work suggests that hybrid bonding polymers, which integrate supramolecular assemblies and covalent networks, offer strategies for the bottom-up design of soft matter that mimics living organisms.

链接: <https://www.nature.com/articles/s41563-020-0707-7>

11. 标题: A biohybrid synapse with neurotransmitter-mediated plasticity

作者: Scott T. Keene, Claudia Lubrano, Setareh Kazemzadeh, Armantas Melianas, Yaakov Tuchman, Giuseppina Polino, Paola Scognamiglio, Lucio Cinà, Alberto Salleo, Yoeri van de Burgt & Francesca Santoro

摘要: Brain-inspired computing paradigms have led to substantial advances in the automation of visual and linguistic tasks by emulating the distributed information processing of biological systems<sup>1</sup>. The similarity between artificial neural networks (ANNs) and biological systems has inspired ANN implementation in biomedical interfaces including prosthetics<sup>2</sup> and brain-machine interfaces<sup>3</sup>. While promising, these implementations rely on software to run ANN algorithms. Ultimately, it is desirable to build hardware ANNs<sup>4,5</sup> that can both directly interface with living tissue and adapt based on biofeedback<sup>6,7</sup>. The first essential step towards biologically integrated neuromorphic systems is to achieve synaptic conditioning based on biochemical signalling activity. Here, we directly couple an organic neuromorphic device with dopaminergic cells to constitute a biohybrid synapse with neurotransmitter-mediated synaptic plasticity. By mimicking the dopamine recycling machinery of the synaptic cleft, we demonstrate both long-term conditioning and recovery of the synaptic weight, paving the way towards combining artificial neuromorphic systems with biological neural networks.

链接: <https://www.nature.com/articles/s41563-020-0703-y>

12. 标题: Understanding the luminescent nature of organic radicals for efficient doublet emitters and pure-red light-emitting diodes

作者: Alim Abdurahman, Timothy J. H. Hele, Qinying Gu, Jiangbin Zhang, Qiming Peng, Ming Zhang, Richard H. Friend, Feng Li & Emrys W. Evans

摘要: The doublet-spin nature of radical emitters is advantageous for applications in organic light-emitting diodes, as it avoids the formation of triplet excitons that limit the electroluminescence efficiency of non-radical emitters. However, radicals generally show low optical absorption and photoluminescence yields. Here we explain the poor optical properties of radicals based on alternant hydrocarbons, and establish design rules to increase the absorption and luminescence yields for donor-acceptor-type radicals. We show that non-alternant systems are necessary to lift the degeneracy of the lowest energy orbital excitations; moreover, intensity borrowing from an intense high-lying transition by the low-energy charge-transfer excitation enhances the oscillator strength of the emitter. We apply these rules to design tris(2,4,6-trichlorophenyl)methyl-pyridindolyl derivatives with a high photoluminescence quantum yield (>90%). Organic light-emitting diodes based on these molecules showed a pure-red emission with an over 12% external quantum efficiency. These insights may be beneficial for the rational design and discovery of highly luminescent doublet emitters.

链接: <https://www.nature.com/articles/s41563-020-0705-9>

13. 标题: Grain-orientation-engineered multilayer ceramic capacitors for energy storage applications

作者: Jinglei Li, Zhonghui Shen, Xianghua Chen, Shuai Yang, Wenlong Zhou, Mingwen Wang, Linghang Wang, Qiangwei Kou, Yingchun Liu, Qun Li, Zhuo Xu, Yunfei Chang, Shujun Zhang & Fei Li

摘要: Dielectric ceramics are highly desired for electronic systems owing to their fast discharge speed and excellent fatigue resistance. However, the low energy density resulting from the low





breakdown electric field leads to inferior volumetric efficiency, which is the main challenge for practical applications of dielectric ceramics. Here, we propose a strategy to increase the breakdown electric field and thus enhance the energy storage density of polycrystalline ceramics by controlling grain orientation. We fabricated high-quality  $\langle 111 \rangle$ -textured  $\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3\text{-Sr}_{0.7}\text{Bi}_{0.2}\text{TiO}_3$  (NBT-SBT) ceramics, in which the strain induced by the electric field is substantially lowered, leading to a reduced failure probability and improved Weibull breakdown strength, on the order of  $10^3 \text{ MV m}^{-1}$ , an  $\sim 65\%$  enhancement compared to their randomly oriented counterparts. The recoverable energy density of  $\langle 111 \rangle$ -textured NBT-SBT multilayer ceramics is up to  $21.5 \text{ J cm}^{-3}$ , outperforming state-of-the-art dielectric ceramics. The present research offers a route for designing dielectric ceramics with enhanced breakdown strength, which is expected to benefit a wide range of applications of dielectric ceramics for which high breakdown strength is required, such as high-voltage capacitors and electrocaloric solid-state cooling devices.

链接: <https://www.nature.com/articles/s41563-020-0704-x>

14.标题: Ferroelectric domain wall memory with embedded selector realized in  $\text{LiNbO}_3$  single crystals integrated on Si wafers

作者: An Quan Jiang, Wen Ping Geng, Peng Lv, Jia-wang Hong, Jun Jiang, Chao Wang, Xiao Jie Chai, Jian Wei Lian, Yan Zhang, Rong Huang, David Wei Zhang, James F. Scott & Cheol Seong Hwang

摘要: Interfacial ‘dead’ layers between metals and ferroelectric thin films generally induce detrimental effects in nanocapacitors, yet their peculiar properties can prove advantageous in other electronic devices. Here, we show that dead layers with low Li concentration located at the surface of  $\text{LiNbO}_3$  ferroelectric materials can function as unipolar selectors.  $\text{LiNbO}_3$  mesa cells were etched from a single-crystal  $\text{LiNbO}_3$  substrate, and Pt metal contacts were deposited on their sides. Poling induced non-volatile switching of ferroelectric domains in the cell, and volatile switching in the domains in the interfacial (dead) layers, with the domain walls created within the substrate being electrically conductive. These features were also confirmed using single-crystal  $\text{LiNbO}_3$  thin films bonded to  $\text{SiO}_2/\text{Si}$  wafers. The fabricated nanoscale mesa-structured memory cell with an embedded interfacial-layer selector shows a high on-to-off ratio ( $>10^6$ ) and high switching endurance ( $\sim 10^{10}$  cycles), showing potential for the fabrication of crossbar arrays of ferroelectric domain wall memories.

链接: <https://www.nature.com/articles/s41563-020-0702-z>

15.标题: Resilient yet entirely degradable gelatin-based biogels for soft robots and electronics

作者: Melanie Baumgartner, Florian Hartmann, Michael Drack, David Preninger, Daniela Wirthl, Robert Gerstmayr, Lukas Lehner, Guoyong Mao, Roland Pruckner, Stepan Demchyshyn, Lisa Reiter, Moritz Strobel, Thomas Stockinger, David Schiller, Susanne Kimeswenger, Florian Greibich, Gerda Buchberger, Elke Bradt, Sabine Hild, Siegfried Bauer & Martin Kaltenbrunner

摘要: Biodegradable and biocompatible elastic materials for soft robotics, tissue engineering or stretchable electronics with good mechanical properties, tunability, modifiability or healing properties drive technological advance, and yet they are not durable under ambient conditions and do not combine all the attributes in a single platform. We have developed a versatile gelatin-based biogel, which is highly resilient with outstanding elastic characteristics, yet degrades fully when disposed. It

self-adheres, is rapidly healable and derived entirely from natural and food-safe constituents. We merge all the favourable attributes in one material that is easy to reproduce and scalable, and has a low-cost production under ambient conditions. This biogel is a step towards durable, life-like soft robotic and electronic systems that are sustainable and closely mimic their natural antetypes.

链接: <https://www.nature.com/articles/s41563-020-0699-3>

16. 标题: Highly efficient luminescence from space-confined charge-transfer emitters

作者: Xun Tang, Lin-Song Cui, Hong-Cheng Li, Alexander J. Gillett, Florian Auras, Yang-Kun Qu, Cheng Zhong, Saul T. E. Jones, Zuo-Quan Jiang, Richard H. Friend & Liang-Sheng Liao

摘要: Charge-transfer (CT) complexes, formed by electron transfer from a donor to an acceptor, play a crucial role in organic semiconductors. Excited-state CT complexes, termed exciplexes, harness both singlet and triplet excitons for light emission, and are thus useful for organic light-emitting diodes (OLEDs). However, present exciplex emitters often suffer from low photoluminescence quantum efficiencies (PLQEs), due to limited control over the relative orientation, electronic coupling and non-radiative recombination channels of the donor and acceptor subunits. Here, we use a rigid linker to control the spacing and relative orientation of the donor and acceptor subunits, as demonstrated with a series of intramolecular exciplex emitters based on 10-phenyl-9,10-dihydroacridine and 2,4,6-triphenyl-1,3,5-triazine. Sky-blue OLEDs employing one of these emitters achieve an external quantum efficiency (EQE) of 27.4% at 67 cd m<sup>-2</sup> with only minor efficiency roll-off (EQE = 24.4%) at a higher luminous intensity of 1,000 cd m<sup>-2</sup>. As a control experiment, devices using chemically and structurally related but less rigid emitters reach substantially lower EQEs. These design rules are transferrable to other donor/acceptor combinations, which will allow further tuning of emission colour and other key optoelectronic properties.

链接: <https://www.nature.com/articles/s41563-020-0710-z>

17. 标题: Imaging and control of critical fluctuations in two-dimensional magnets

作者: Chenhao Jin, Zui Tao, Kaifei Kang, Kenji Watanabe, Takashi Taniguchi, Kin Fai Mak & Jie Shan

摘要: Strong magnetization fluctuations are expected near the thermodynamic critical point of a continuous magnetic phase transition. Such critical fluctuations are highly correlated and in principle can occur at any time and length scales<sup>1</sup>; they govern critical phenomena and potentially can drive new phases<sup>2,3</sup>. Although critical phenomena in magnetic materials have been studied using neutron scattering, magnetic a.c. susceptibility and other techniques<sup>4,5,6</sup>, direct real-time imaging of critical magnetization fluctuations remains elusive. Here we develop a fast and sensitive magneto-optical imaging microscope to achieve wide-field, real-time monitoring of critical magnetization fluctuations in single-layer ferromagnetic insulator CrBr<sub>3</sub>. We track the critical phenomena directly from the fluctuation correlations and observe both slowing-down dynamics and enhanced correlation length. Through real-time feedback control of the critical fluctuations, we further achieve switching of magnetic states solely by electrostatic gating. The ability to directly image and control critical fluctuations in 2D magnets opens up exciting opportunities to explore critical phenomena and develop applications in nanoscale engines and information science.

链接: <https://www.nature.com/articles/s41563-020-0706-8>

18.标题: Polar meron lattice in strained oxide ferroelectrics

作者: Y. J. Wang, Y. P. Feng, Y. L. Zhu, Y. L. Tang, L. X. Yang, M. J. Zou, W. R. Geng, M. J. Han, X. W. Guo, B. Wu & X. L. Ma

摘要: A topological meron features a non-coplanar structure, whose order parameters in the core region are perpendicular to those near the perimeter. A meron is half of a skyrmion, and both have potential applications for information carrying and storage. Although merons and skyrmions in ferromagnetic materials can be readily obtained via inter-spin interactions, their behaviour and even existence in ferroelectric materials are still elusive. Here we observe using electron microscopy not only the atomic morphology of merons with a topological charge of  $1/2$ , but also a periodic meron lattice in ultrathin  $\text{PbTiO}_3$  films under tensile epitaxial strain on a  $\text{SmScO}_3$  substrate. Phase-field simulations rationalize the formation of merons for which an epitaxial strain, as a single alterable parameter, plays a critical role in the coupling of lattice and charge. This study suggests that by engineering strain at the nanoscale it should be possible to fabricate topological polar textures, which in turn could facilitate the development of nanoscale ferroelectric devices.

链接: <https://www.nature.com/articles/s41563-020-0694-8>

19.标题: Electric-field-driven dual-functional molecular switches in tunnel junctions

作者: Yingmei Han, Cameron Nickle, Ziyu Zhang, Hippolyte P. A. G. Astier, Thorin J. Duffin, Dongchen Qi, Zhe Wang, Enrique del Barco, Damien Thompson & Christian A. Nijhuis

摘要: To avoid crosstalk and suppress leakage currents in resistive random access memories (RRAMs), a resistive switch and a current rectifier (diode) are usually combined in series in a one diode–one resistor (1D–1R) RRAM. However, this complicates the design of next-generation RRAM, increases the footprint of devices and increases the operating voltage as the potential drops over two consecutive junctions. Here, we report a molecular tunnel junction based on molecules that provide an unprecedented dual functionality of diode and variable resistor, resulting in a molecular-scale 1D–1R RRAM with a current rectification ratio of  $2.5 \times 10^4$  and resistive on/off ratio of  $6.7 \times 10^3$ , and a low drive voltage of 0.89 V. The switching relies on dimerization of redox units, resulting in hybridization of molecular orbitals accompanied by directional ion migration. This electric-field-driven molecular switch operating in the tunnelling regime enables a class of molecular devices where multiple electronic functions are preprogrammed inside a single molecular layer with a thickness of only 2 nm.

链接: <https://www.nature.com/articles/s41563-020-0697-5>

20.标题: Materials for flexible bioelectronic systems as chronic neural interfaces

作者: Enming Song, Jinghua Li, Sang Min Won, Wubin Bai & John A. Rogers

摘要: Engineered systems that can serve as chronically stable, high-performance electronic recording and stimulation interfaces to the brain and other parts of the nervous system, with cellular-level resolution across macroscopic areas, are of broad interest to the neuroscience and biomedical communities. Challenges remain in the development of biocompatible materials and the design of flexible implants for these purposes, where ultimate goals are for performance attributes approaching those of conventional wafer-based technologies and for operational timescales reaching the human lifespan. This Review summarizes recent advances in this field, with emphasis on active and passive constituent materials, design architectures and integration methods that support necessary levels of



biocompatibility, electronic functionality, long-term stable operation in biofluids and reliability for use in vivo. Bioelectronic systems that enable multiplexed electrophysiological mapping across large areas at high spatiotemporal resolution are surveyed, with a particular focus on those with proven chronic stability in live animal models and scalability to thousands of channels over human-brain-scale dimensions. Research in materials science will continue to underpin progress in this field of study.

链接: <https://www.nature.com/articles/s41563-020-0679-7>

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## *IEL Top25*

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(来源: <http://ieeexplore.ieee.org/>)

1.标题: Early Prediction of the 2019 Novel Coronavirus Outbreak in the Mainland China Based on Simple Mathematical Model

出处: IEEE Access

作者: Linhao Zhong ; Lin Mu ; Jing Li ; Jiaying Wang ; Zhe Yin ; Darong Liu

摘要: The 2019 novel coronavirus (2019-nCoV) outbreak has been treated as a Public Health Emergency of International Concern by the World Health Organization. This work made an early prediction of the 2019-nCoV outbreak in China based on a simple mathematical model and limited epidemiological data. Combing characteristics of the historical epidemic, we found part of the released data is unreasonable. Through ruling out the unreasonable data, the model predictions exhibit that the number of the cumulative 2019-nCoV cases may reach 76,000 to 230,000, with a peak of the unrecovered infectives (22,000-74,000) occurring in late February to early March. After that, the infected cases will rapidly monotonically decrease until early May to late June, when the 2019-nCoV outbreak will fade out. Strong anti-epidemic may reduce the cumulative infected cases by 40%-49%. The improvement of medical care can also lead to about one-half transmission decrease and effectively shorten the duration of the 2019-nCoV.

链接: <https://ieeexplore.ieee.org/document/9028194>

2. 标题: Internet of Things for Smart Cities

出处: IEEE Internet of Things Journal

作者: Andrea Zanella ; Nicola Bui ; Angelo Castellani ; Lorenzo Vangelista ; Michele Zorzi

摘要: The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. In this paper, we focus specifically to an urban IoT system that, while still being quite a broad category, are characterized by their specific application domain. Urban IoTs, in fact, are designed to support the Smart City vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens. This paper hence provides a comprehensive survey of the enabling technologies, protocols, and architecture for an urban IoT. Furthermore, the paper will present and discuss the technical solutions and best-practice guidelines adopted in the Padova Smart City project, a proof-of-concept deployment of an IoT island in the city of Padova, Italy, performed in collaboration with the city municipality.

链接: <https://ieeexplore.ieee.org/document/6740844>

3. 标题: Characterizing the Propagation of Situational Information in Social Media During COVID-19 Epidemic: A Case Study on Weibo

出处: IEEE Transactions on Computational Social Systems

作者: Lifang Li ; Qingpeng Zhang ; Xiao Wang ; Jun Zhang ; Tao Wang ; Tian-Lu Gao ; Wei Duan ; Kelvin Kam-fai Tsoi ; Fei-Yue Wang

摘要: During the ongoing outbreak of coronavirus disease (COVID-19), people use social media to acquire and exchange various types of information at a historic and unprecedented scale. Only the situational information are valuable for the public and authorities to response to the epidemic. Therefore, it is important to identify such situational information and to understand how it is being propagated on social media, so that appropriate information publishing strategies can be informed for the COVID-19 epidemic. This article sought to fill this gap by harnessing Weibo data and natural language processing techniques to classify the COVID-19-related information into seven types of situational information. We found specific features in predicting the reposted amount of each type of information. The results provide data-driven insights into the information need and public attention.

链接: <https://ieeexplore.ieee.org/document/9043580>

4. 标题: Blockchains and Smart Contracts for the Internet of Things

出处: IEEE Access

作者: Konstantinos Christidis ; Michael Devetsikiotis

摘要: Motivated by the recent explosion of interest around blockchains, we examine whether they make a good fit for the Internet of Things (IoT) sector. Blockchains allow us to have a distributed peer-to-peer network where non-trusting members can interact with each other without a trusted intermediary, in a verifiable manner. We review how this mechanism works and also look into smart contracts-scripts that reside on the blockchain that allow for the automation of multi-step processes. We then move into the IoT domain, and describe how a blockchain-IoT combination: 1) facilitates the sharing of services and resources leading to the creation of a marketplace of services between devices and 2) allows us to automate in a cryptographically verifiable manner several existing, time-consuming workflows. We also point out certain issues that should be considered before the deployment of a blockchain network in an IoT setting: from transactional privacy to the expected value of the digitized assets traded on the network. Wherever applicable, we identify solutions and workarounds. Our conclusion is that the blockchain-IoT combination is powerful and can cause significant transformations across several industries, paving the way for new business models and novel, distributed applications.

链接: <https://ieeexplore.ieee.org/document/7467408>

5. 标题: Peeking Inside the Black-Box: A Survey on Explainable Artificial Intelligence (XAI)

出处: IEEE Access

作者: Amina Adadi ; Mohammed Berrada

摘要: At the dawn of the fourth industrial revolution, we are witnessing a fast and widespread adoption of artificial intelligence (AI) in our daily life, which contributes to accelerating the shift towards a more algorithmic society. However, even with such unprecedented advancements, a key impediment to the use of AI-based systems is that they often lack transparency. Indeed, the black-box nature of these systems allows powerful predictions, but it cannot be directly explained. This issue

has triggered a new debate on explainable AI (XAI). A research field holds substantial promise for improving trust and transparency of AI-based systems. It is recognized as the sine qua non for AI to continue making steady progress without disruption. This survey provides an entry point for interested researchers and practitioners to learn key aspects of the young and rapidly growing body of research related to XAI. Through the lens of the literature, we review the existing approaches regarding the topic, discuss trends surrounding its sphere, and present major research trajectories.

链接: <https://ieeexplore.ieee.org/document/8466590>

6. 标题: A Comprehensive Review of the COVID-19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing its Impact

出处: IEEE Access

作者: Vinay Chamola ; Vikas Hassija ; Vatsal Gupta ; Mohsen Guizani

摘要: The unprecedented outbreak of the 2019 novel coronavirus, termed as COVID-19 by the World Health Organization (WHO), has placed numerous governments around the world in a precarious position. The impact of the COVID-19 outbreak, earlier witnessed by the citizens of China alone, has now become a matter of grave concern for virtually every country in the world. The scarcity of resources to endure the COVID-19 outbreak combined with the fear of overburdened healthcare systems has forced a majority of these countries into a state of partial or complete lockdown. The number of laboratory-confirmed coronavirus cases has been increasing at an alarming rate throughout the world, with reportedly more than 3 million confirmed cases as of 30 April 2020. Adding to these woes, numerous false reports, misinformation, and unsolicited fears in regards to coronavirus, are being circulated regularly since the outbreak of the COVID-19. In response to such acts, we draw on various reliable sources to present a detailed review of all the major aspects associated with the COVID-19 pandemic. In addition to the direct health implications associated with the outbreak of COVID-19, this study highlights its impact on the global economy. In drawing things to a close, we explore the use of technologies such as the Internet of Things (IoT), Unmanned Aerial Vehicles (UAVs), blockchain, Artificial Intelligence (AI), and 5G, among others, to help mitigate the impact of COVID-19 outbreak.

链接: <https://ieeexplore.ieee.org/document/9086010>

7. 标题: SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation

出处: IEEE Transactions on Pattern Analysis and Machine Intelligence

作者: Vijay Badrinarayanan ; Alex Kendall ; Roberto Cipolla

摘要: We present a novel and practical deep fully convolutional neural network architecture for semantic pixel-wise segmentation termed SegNet. This core trainable segmentation engine consists of an encoder network, a corresponding decoder network followed by a pixel-wise classification layer. The architecture of the encoder network is topologically identical to the 13 convolutional layers in the VGG16 network [1]. The role of the decoder network is to map the low resolution encoder feature maps to full input resolution feature maps for pixel-wise classification. The novelty of SegNet lies in the manner in which the decoder upsamples its lower resolution input feature map(s). Specifically, the decoder uses pooling indices computed in the max-pooling step of the corresponding encoder to perform non-linear upsampling. This eliminates the need for learning to upsample. The upsampled maps are sparse and are then convolved with trainable filters to produce

dense feature maps. We compare our proposed architecture with the widely adopted FCN [2] and also with the well known DeepLab-LargeFOV [3], DeconvNet [4] architectures. This comparison reveals the memory versus accuracy trade-off involved in achieving good segmentation performance. SegNet was primarily motivated by scene understanding applications. Hence, it is designed to be efficient both in terms of memory and computational time during inference. It is also significantly smaller in the number of trainable parameters than other competing architectures and can be trained end-to-end using stochastic gradient descent. We also performed a controlled benchmark of SegNet and other architectures on both road scenes and SUN RGB-D indoor scene segmentation tasks. These quantitative assessments show that SegNet provides good performance with competitive inference time and most efficient inference memory-wise as compared to other architectures. We also provide a Caffe implementation of SegNet and a web demo at <http://mi.eng.cam.ac.uk/~3.141>.

链接: <https://ieeexplore.ieee.org/document/7803544>

8. 标题: Does Gamification Work? -- A Literature Review of Empirical Studies on Gamification

出处: 2014 47th Hawaii International Conference on System Sciences

作者: Juho Hamari ; Jonna Koivisto ; Harri Sarsa

摘要: This paper reviews peer-reviewed empirical studies on gamification. We create a framework for examining the effects of gamification by drawing from the definitions of gamification and the discussion on motivational affordances. The literature review covers results, independent variables (examined motivational affordances), dependent variables (examined psychological/behavioral outcomes from gamification), the contexts of gamification, and types of studies performed on the gamified systems. The paper examines the state of current research on the topic and points out gaps in existing literature. The review indicates that gamification provides positive effects, however, the effects are greatly dependent on the context in which the gamification is being implemented, as well as on the users using it. The findings of the review provide insight for further studies as well as for the design of gamified systems.

链接: <https://ieeexplore.ieee.org/document/6758978>

9. 标题: SoCodeCNN: Program Source Code for Visual CNN Classification Using Computer Vision Methodology

出处: IEEE Access

作者: Somdip Dey ; Amit Kumar Singh ; Dilip Kumar Prasad ; Klaus Dieter McDonald-Maier

摘要: Automated feature extraction from program source-code such that proper computing resources could be allocated to the program is very difficult given the current state of technology. Therefore, conventional methods call for skilled human intervention in order to achieve the task of feature extraction from programs. This research is the first to propose a novel human-inspired approach to automatically convert program source-codes to visual images. The images could be then utilized for automated classification by visual convolutional neural network (CNN) based algorithm. Experimental results show high prediction accuracy in classifying the types of program in a completely automated manner using this approach.

链接: <https://ieeexplore.ieee.org/document/8882216/>



10. 标题: Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications

出处: IEEE Communications Surveys & Tutorials

作者: Ala Al-Fuqaha ; Mohsen Guizani ; Mehdi Mohammadi ; Mohammed Aledhari ; Moussa Ayyash

摘要: This paper provides an overview of the Internet of Things (IoT) with emphasis on enabling technologies, protocols, and application issues. The IoT is enabled by the latest developments in RFID, smart sensors, communication technologies, and Internet protocols. The basic premise is to have smart sensors collaborate directly without human involvement to deliver a new class of applications. The current revolution in Internet, mobile, and machine-to-machine (M2M) technologies can be seen as the first phase of the IoT. In the coming years, the IoT is expected to bridge diverse technologies to enable new applications by connecting physical objects together in support of intelligent decision making. This paper starts by providing a horizontal overview of the IoT. Then, we give an overview of some technical details that pertain to the IoT enabling technologies, protocols, and applications. Compared to other survey papers in the field, our objective is to provide a more thorough summary of the most relevant protocols and application issues to enable researchers and application developers to get up to speed quickly on how the different protocols fit together to deliver desired functionalities without having to go through RFCs and the standards specifications. We also provide an overview of some of the key IoT challenges presented in the recent literature and provide a summary of related research work. Moreover, we explore the relation between the IoT and other emerging technologies including big data analytics and cloud and fog computing. We also present the need for better horizontal integration among IoT services. Finally, we present detailed service use-cases to illustrate how the different protocols presented in the paper fit together to deliver desired IoT services.

链接: <https://ieeexplore.ieee.org/document/7123563>

11. 标题: A Survey of 5G Network: Architecture and Emerging Technologies

出处: IEEE Access

作者: A. Gupta ; R. K. Jha

摘要: In the near future, i.e., beyond 4G, some of the prime objectives or demands that need to be addressed are increased capacity, improved data rate, decreased latency, and better quality of service. To meet these demands, drastic improvements need to be made in cellular network architecture. This paper presents the results of a detailed survey on the fifth generation (5G) cellular network architecture and some of the key emerging technologies that are helpful in improving the architecture and meeting the demands of users. In this detailed survey, the prime focus is on the 5G cellular network architecture, massive multiple input multiple output technology, and device-to-device communication (D2D). Along with this, some of the emerging technologies that are addressed in this paper include interference management, spectrum sharing with cognitive radio, ultra-dense networks, multi-radio access technology association, full duplex radios, millimeter wave solutions for 5G cellular networks, and cloud technologies for 5G radio access networks and software defined networks. In this paper, a general probable 5G cellular network architecture is proposed, which shows that D2D, small cell access points, network cloud, and the Internet of Things can be a part of 5G cellular network architecture. A detailed survey is included regarding current research projects being conducted in different countries by research groups and institutions that are working on 5G

technologies.

链接: <https://ieeexplore.ieee.org/document/7169508>

12. 标题: A Linear Model Based on Principal Component Analysis for Disease Prediction

出处: IEEE Access

作者: H. Roopa ; T. Asha

摘要: Various classification methods are applied to predict different diseases, such as diabetes, tuberculosis, and so on, in medical field. Diagnosis of diabetes can be analyzed by checking the level of blood sugar of patient with the normal known levels, blood pressure, BMI, skin thickness, and so on. Several classification methods have been implemented on diabetes. In this paper, the main aim is to build a statistical model for diabetes data to get better classification accuracy. Extracted features of diabetes data are projected to a new space using principal component analysis, then, it is modeled by applying linear regression method on these newly formed attributes. The accuracy obtained by this method is 82.1% for predicting diabetes which has reformed over other existing classification methods.

链接: <https://ieeexplore.ieee.org/document/8781773>

13. 标题: Deep Learning Applications in Medical Image Analysis

出处: IEEE Access

作者: Justin Ker ; Lipo Wang ; Jai Rao ; Tchoyoson Lim

摘要: The tremendous success of machine learning algorithms at image recognition tasks in recent years intersects with a time of dramatically increased use of electronic medical records and diagnostic imaging. This review introduces the machine learning algorithms as applied to medical image analysis, focusing on convolutional neural networks, and emphasizing clinical aspects of the field. The advantage of machine learning in an era of medical big data is that significant hierarchal relationships within the data can be discovered algorithmically without laborious hand-crafting of features. We cover key research areas and applications of medical image classification, localization, detection, segmentation, and registration. We conclude by discussing research obstacles, emerging trends, and possible future directions.

链接: <https://ieeexplore.ieee.org/document/8241753>

14. 标题: A Tutorial on IEEE 802.11ax High Efficiency WLANs

出处: IEEE Communications Surveys & Tutorials

作者: Evgeny Khorov ; Anton Kiryanov ; Andrey Lyakhov ; Giuseppe Bianchi

摘要: While celebrating the 21st year since the very first IEEE 802.11 “legacy” 2 Mbit/s wireless local area network standard, the latest Wi-Fi newborn is today reaching the finish line, topping the remarkable speed of 10 Gbit/s. IEEE 802.11ax was launched in May 2014 with the goal of enhancing throughput-per-area in high-density scenarios. The first 802.11ax draft versions, namely, D1.0 and D2.0, were released at the end of 2016 and 2017. Focusing on a more mature version D3.0, in this tutorial paper, we help the reader to smoothly enter into the several major 802.11ax breakthroughs, including a brand new orthogonal frequency-division multiple access-based random access approach as well as novel spatial frequency reuse techniques. In addition, this tutorial will highlight selected significant improvements (including physical layer enhancements, multi-user multiple input multiple

output extensions, power saving advances, and so on) which make this standard a very significant step forward with respect to its predecessor 802.11ac.

链接: <https://ieeexplore.ieee.org/document/8468986>

15. 标题: A Survey of Data Mining and Machine Learning Methods for Cyber Security Intrusion Detection

出处: IEEE Communications Surveys & Tutorials

作者: Anna L. Buczak ; Erhan Guven

摘要: This survey paper describes a focused literature survey of machine learning (ML) and data mining (DM) methods for cyber analytics in support of intrusion detection. Short tutorial descriptions of each ML/DM method are provided. Based on the number of citations or the relevance of an emerging method, papers representing each method were identified, read, and summarized. Because data are so important in ML/DM approaches, some well-known cyber data sets used in ML/DM are described. The complexity of ML/DM algorithms is addressed, discussion of challenges for using ML/DM for cyber security is presented, and some recommendations on when to use a given method are provided.

链接: <https://ieeexplore.ieee.org/document/7307098>

16. 标题: The Internet of Things for Health Care: A Comprehensive Survey

出处: IEEE Access

作者: S. M. Riazul Islam ; Daehan Kwak ; MD. Humaun Kabir ; Mahmud Hossain ; Kyung-Sup Kwak

摘要: The Internet of Things (IoT) makes smart objects the ultimate building blocks in the development of cyber-physical smart pervasive frameworks. The IoT has a variety of application domains, including health care. The IoT revolution is redesigning modern health care with promising technological, economic, and social prospects. This paper surveys advances in IoT-based health care technologies and reviews the state-of-the-art network architectures/platforms, applications, and industrial trends in IoT-based health care solutions. In addition, this paper analyzes distinct IoT security and privacy features, including security requirements, threat models, and attack taxonomies from the health care perspective. Further, this paper proposes an intelligent collaborative security model to minimize security risk; discusses how different innovations such as big data, ambient intelligence, and wearables can be leveraged in a health care context; addresses various IoT and eHealth policies and regulations across the world to determine how they can facilitate economies and societies in terms of sustainable development; and provides some avenues for future research on IoT-based health care based on a set of open issues and challenges.

链接: <https://ieeexplore.ieee.org/document/7113786/>

17. 标题: PiiGAN: Generative Adversarial Networks for Pluralistic Image Inpainting

出处: IEEE Access

作者: Weiwei Cai ; Zhanguo Wei

摘要: The latest methods based on deep learning have achieved amazing results regarding the complex work of inpainting large missing areas in an image. But this type of method generally attempts to generate one single “optimal” result, ignoring many other plausible results. Considering

the uncertainty of the inpainting task, one sole result can hardly be regarded as a desired regeneration of the missing area. In view of this weakness, which is related to the design of the previous algorithms, we propose a novel deep generative model equipped with a brand new style extractor which can extract the style feature (latent vector) from the ground truth. Once obtained, the extracted style feature and the ground truth are both input into the generator. We also craft a consistency loss that guides the generated image to approximate the ground truth. After iterations, our generator is able to learn the mapping of styles corresponding to multiple sets of vectors. The proposed model can generate a large number of results consistent with the context semantics of the image. Moreover, we evaluated the effectiveness of our model on three datasets, i.e., CelebA, PlantVillage, and MauFlex. Compared to state-of-the-art inpainting methods, this model is able to offer desirable inpainting results with both better quality and higher diversity. The code and model will be made available on <https://github.com/vivitsai/PiiGAN>.

链接: <https://ieeexplore.ieee.org/document/9027849>

18. 标题: Deep Convolutional Neural Networks for Computer-Aided Detection: CNN Architectures, Dataset Characteristics and Transfer Learning

出处: IEEE Transactions on Medical Imaging

作者: Hoo-Chang Shin ; Holger R. Roth ; Mingchen Gao ; Le Lu ; Ziyue Xu ; Isabella Nogues ; Jianhua Yao ; Daniel Mollura ; Ronald M. Summers

摘要: Remarkable progress has been made in image recognition, primarily due to the availability of large-scale annotated datasets and deep convolutional neural networks (CNNs). CNNs enable learning data-driven, highly representative, hierarchical image features from sufficient training data. However, obtaining datasets as comprehensively annotated as ImageNet in the medical imaging domain remains a challenge. There are currently three major techniques that successfully employ CNNs to medical image classification: training the CNN from scratch, using off-the-shelf pre-trained CNN features, and conducting unsupervised CNN pre-training with supervised fine-tuning. Another effective method is transfer learning, i.e., fine-tuning CNN models pre-trained from natural image dataset to medical image tasks. In this paper, we exploit three important, but previously understudied factors of employing deep convolutional neural networks to computer-aided detection problems. We first explore and evaluate different CNN architectures. The studied models contain 5 thousand to 160 million parameters, and vary in numbers of layers. We then evaluate the influence of dataset scale and spatial image context on performance. Finally, we examine when and why transfer learning from pre-trained ImageNet (via fine-tuning) can be useful. We study two specific computer-aided detection (CADe) problems, namely thoraco-abdominal lymph node (LN) detection and interstitial lung disease (ILD) classification. We achieve the state-of-the-art performance on the mediastinal LN detection, and report the first five-fold cross-validation classification results on predicting axial CT slices with ILD categories. Our extensive empirical evaluation, CNN model analysis and valuable insights can be extended to the design of high performance CAD systems for other medical imaging tasks.

链接: <https://ieeexplore.ieee.org/document/7404017>

19. 标题: Millimeter Wave Mobile Communications for 5G Cellular: It Will Work!

出处: IEEE Access

作者: Theodore S. Rappaport ; Shu Sun ; Rimma Mayzus ; Hang Zhao ; Yaniv Azar ; Kevin Wang ; George N. Wong ; Jocelyn K. Schulz ; Mathew Samimi ; Felix Gutierrez

摘要: The global bandwidth shortage facing wireless carriers has motivated the exploration of the underutilized millimeter wave (mm-wave) frequency spectrum for future broadband cellular communication networks. There is, however, little knowledge about cellular mm-wave propagation in densely populated indoor and outdoor environments. Obtaining this information is vital for the design and operation of future fifth generation cellular networks that use the mm-wave spectrum. In this paper, we present the motivation for new mm-wave cellular systems, methodology, and hardware for measurements and offer a variety of measurement results that show 28 and 38 GHz frequencies can be used when employing steerable directional antennas at base stations and mobile devices.

链接: <https://ieeexplore.ieee.org/document/6515173>

20. 标题: Deep Learning for Health Informatics

出处: IEEE Journal of Biomedical and Health Informatics

作者: Daniele Ravi ; Charence Wong ; Fani Deligianni ; Melissa Berthelot ; Javier Andreu-Perez ; Benny Lo ; Guang-Zhong Yang

摘要: With a massive influx of multimodality data, the role of data analytics in health informatics has grown rapidly in the last decade. This has also prompted increasing interests in the generation of analytical, data driven models based on machine learning in health informatics. Deep learning, a technique with its foundation in artificial neural networks, is emerging in recent years as a powerful tool for machine learning, promising to reshape the future of artificial intelligence. Rapid improvements in computational power, fast data storage, and parallelization have also contributed to the rapid uptake of the technology in addition to its predictive power and ability to generate automatically optimized high-level features and semantic interpretation from the input data. This article presents a comprehensive up-to-date review of research employing deep learning in health informatics, providing a critical analysis of the relative merit, and potential pitfalls of the technique as well as its future outlook. The paper mainly focuses on key applications of deep learning in the fields of translational bioinformatics, medical imaging, pervasive sensing, medical informatics, and public health.

链接: <https://ieeexplore.ieee.org/document/7801947>

21. 标题: Modeling and Discovering Vulnerabilities with Code Property Graphs

出处: 2014 IEEE Symposium on Security and Privacy

作者: Fabian Yamaguchi ; Nico Golde ; Daniel Arp ; Konrad Rieck

摘要: The vast majority of security breaches encountered today are a direct result of insecure code. Consequently, the protection of computer systems critically depends on the rigorous identification of vulnerabilities in software, a tedious and error-prone process requiring significant expertise. Unfortunately, a single flaw suffices to undermine the security of a system and thus the sheer amount of code to audit plays into the attacker's cards. In this paper, we present a method to effectively mine large amounts of source code for vulnerabilities. To this end, we introduce a novel representation of source code called a code property graph that merges concepts of classic program analysis, namely

abstract syntax trees, control flow graphs and program dependence graphs, into a joint data structure. This comprehensive representation enables us to elegantly model templates for common vulnerabilities with graph traversals that, for instance, can identify buffer overflows, integer overflows, format string vulnerabilities, or memory disclosures. We implement our approach using a popular graph database and demonstrate its efficacy by identifying 18 previously unknown vulnerabilities in the source code of the Linux kernel.

链接: <https://ieeexplore.ieee.org/document/6956589/>

22. 标题: Disease Prediction by Machine Learning Over Big Data From Healthcare Communities

出处: IEEE Access

作者: Min Chen ; Yixue Hao ; Kai Hwang ; Lu Wang ; Lin Wang

摘要: With big data growth in biomedical and healthcare communities, accurate analysis of medical data benefits early disease detection, patient care, and community services. However, the analysis accuracy is reduced when the quality of medical data is incomplete. Moreover, different regions exhibit unique characteristics of certain regional diseases, which may weaken the prediction of disease outbreaks. In this paper, we streamline machine learning algorithms for effective prediction of chronic disease outbreak in disease-frequent communities. We experiment the modified prediction models over real-life hospital data collected from central China in 2013-2015. To overcome the difficulty of incomplete data, we use a latent factor model to reconstruct the missing data. We experiment on a regional chronic disease of cerebral infarction. We propose a new convolutional neural network (CNN)-based multimodal disease risk prediction algorithm using structured and unstructured data from hospital. To the best of our knowledge, none of the existing work focused on both data types in the area of medical big data analytics. Compared with several typical prediction algorithms, the prediction accuracy of our proposed algorithm reaches 94.8% with a convergence speed, which is faster than that of the CNN-based unimodal disease risk prediction algorithm.

链接: <https://ieeexplore.ieee.org/document/7912315>

23. 标题: Toward Scalable Systems for Big Data Analytics: A Technology Tutorial

出处: IEEE Access

作者: Han Hu ; Yonggang Wen ; Tat-Seng Chua ; Xuelong Li

摘要: Recent technological advancements have led to a deluge of data from distinctive domains (e.g., health care and scientific sensors, user-generated data, Internet and financial companies, and supply chain systems) over the past two decades. The term big data was coined to capture the meaning of this emerging trend. In addition to its sheer volume, big data also exhibits other unique characteristics as compared with traditional data. For instance, big data is commonly unstructured and require more real-time analysis. This development calls for new system architectures for data acquisition, transmission, storage, and large-scale data processing mechanisms. In this paper, we present a literature survey and system tutorial for big data analytics platforms, aiming to provide an overall picture for nonexpert readers and instill a do-it-yourself spirit for advanced audiences to customize their own big-data solutions. First, we present the definition of big data and discuss big data challenges. Next, we present a systematic framework to decompose big data systems into four sequential modules, namely data generation, data acquisition, data storage, and data analytics. These four modules form a big data value chain. Following that, we present a detailed survey of numerous

approaches and mechanisms from research and industry communities. In addition, we present the prevalent Hadoop framework for addressing big data challenges. Finally, we outline several evaluation benchmarks and potential research directions for big data systems.

链接: <https://ieeexplore.ieee.org/document/6842585/>

24. 标题: Security for 5G Mobile Wireless Networks

出处: IEEE Access

作者: Dongfeng Fang ; Yi Qian ; Rose Qingyang Hu

摘要: The advanced features of 5G mobile wireless network systems yield new security requirements and challenges. This paper presents a comprehensive study on the security of 5G wireless network systems compared with the traditional cellular networks. The paper starts with a review on 5G wireless networks particularities as well as on the new requirements and motivations of 5G wireless security. The potential attacks and security services are summarized with the consideration of new service requirements and new use cases in 5G wireless networks. The recent development and the existing schemes for the 5G wireless security are presented based on the corresponding security services, including authentication, availability, data confidentiality, key management, and privacy. This paper further discusses the new security features involving different technologies applied to 5G, such as heterogeneous networks, device-to-device communications, massive multiple-input multiple-output, software-defined networks, and Internet of Things. Motivated by these security research and development activities, we propose a new 5G wireless security architecture, based on which the analysis of identity management and flexible authentication is provided. As a case study, we explore a handover procedure as well as a signaling load scheme to show the advantages of the proposed security architecture. The challenges and future directions of 5G wireless security are finally summarized.

链接: <https://ieeexplore.ieee.org/document/8125684/>

25. 标题: Deep Convolutional Neural Network for Inverse Problems in Imaging

出处: IEEE Transactions on Image Processing

作者: Kyong Hwan Jin ; Michael T. McCann ; Emmanuel Froustey ; Michael Unser

摘要: In this paper, we propose a novel deep convolutional neural network (CNN)-based algorithm for solving ill-posed inverse problems. Regularized iterative algorithms have emerged as the standard approach to ill-posed inverse problems in the past few decades. These methods produce excellent results, but can be challenging to deploy in practice due to factors including the high computational cost of the forward and adjoint operators and the difficulty of hyperparameter selection. The starting point of this paper is the observation that unrolled iterative methods have the form of a CNN (filtering followed by pointwise nonlinearity) when the normal operator ( $H^*H$ , where  $H^*$  is the adjoint of the forward imaging operator,  $H$ ) of the forward model is a convolution. Based on this observation, we propose using direct inversion followed by a CNN to solve normal-convolutional inverse problems. The direct inversion encapsulates the physical model of the system, but leads to artifacts when the problem is ill posed; the CNN combines multiresolution decomposition and residual learning in order to learn to remove these artifacts while preserving image structure. We demonstrate the performance of the proposed network in sparse-view reconstruction (down to 50 views) on parallel beam X-ray computed tomography in synthetic phantoms as well as in real



experimental sinograms. The proposed network outperforms total variation-regularized iterative reconstruction for the more realistic phantoms and requires less than a second to reconstruct a  $512 \times 512$  image on the GPU.

链接: <https://ieeexplore.ieee.org/document/7949028>



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## *ESI HOT PAPERS*

### *(Materials Science)*

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(来源: <http://esi.incites.thomsonreuters.com>)

1、被引频次: 590

题目: NON-FULLERENE ACCEPTORS FOR ORGANIC SOLAR CELLS

作者: YAN, CQ;BARLOW, S;WANG, ZH;YAN, H;JEN, AKY;MARDER, SR;ZHAN, XW

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地址: PEKING UNIV, DEPT MAT SCI & ENGN, COLL ENGN, KEY LAB POLYMER CHEM & PHYS, MINIST EDUC, BEIJING, PEOPLES R CHINA; GEORGIA INST TECHNOL, SCH CHEM & BIOCHEM, ATLANTA, GA 30332 USA; GEORGIA INST TECHNOL, CTR ORGAN PHOTON & ELECT, ATLANTA, GA 30332 USA; TSINGHUA UNIV, DEPT CHEM, MOE KEY LAB ORGAN OPTOELECT & MOL ENGN, BEIJING, PEOPLES R CHINA; HONG KONG UNIV SCI & TECHNOL, DEPT CHEM, CLEAR WATER BAY, KOWLOON, HONG KONG, PEOPLES R CHINA; HONG KONG UNIV SCI & TECHNOL, CHINESE NATL ENGN RES CTR TISSUE RESTORAT & RECON, CLEAR WATER BAY, HONG KONG BRANCH, KOWLOON, HONG KONG, PEOPLES R CHINA; CITY UNIV HONG KONG, DEPT MAT SCI & ENGN, HONG KONG, HONG KONG, PEOPLES R CHINA

摘要: Non-fullerene acceptors (NFAs) are currently a major focus of research in the development of bulk-heterojunction organic solar cells (OSCs). In contrast to the widely used fullerene acceptors (FAs), the optical properties and electronic energy levels of NFAs can be readily tuned. NFA-based OSCs can also achieve greater thermal stability and photochemical stability, as well as longer device lifetimes, than their FA-based counterparts. Historically, the performance of NFA OSCs has lagged behind that of fullerene devices. However, recent developments have led to a rapid increase in power conversion efficiencies for NFA OSCs, with values now exceeding 13%, demonstrating the viability of using NFAs to replace FAs in next-generation high-performance OSCs. This Review discusses the important work that has led to this remarkable progress, focusing on the two most promising NFA classes to date: rylene diimide-based materials and materials based on fused aromatic cores with strong electron-accepting end groups. The key structure-property relationships, donor-acceptor matching criteria and aspects of device physics are discussed. Finally, we consider the remaining challenges and promising future directions for the NFA OSCs field.

E-mail: [xwzhan@pku.edu.cn](mailto:xwzhan@pku.edu.cn)

2、被引频次: 529

题目: OVER 14% EFFICIENCY IN POLYMER SOLAR CELLS ENABLED BY A CHLORINATED POLYMER DONOR

作者: ZHANG, SQ;QIN, YP;ZHU, J;HOU, JH

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地址: UNIV SCI & TECHNOL BEIJING, SCH CHEM & BIOL ENGN, BEIJING 100083,

PEOPLES R CHINA;CHINESE ACAD SCI, INST CHEM, STATE KEY LAB POLYMER PHYS & CHEM, BEIJING 100190, PEOPLES R CHINA

摘要: Fluorine-contained polymers, which have been widely used in highly efficient polymer solar cells (PSCs), are rather costly due to their complicated synthesis and low yields in the preparation of components. Here, the feasibility of replacing the critical fluorine substituents in high-performance photovoltaic polymer donors with chlorine is demonstrated, and two polymeric donors, PBDB-T-2F and PBDB-T-2Cl, are synthesized and compared in parallel. The synthesis of PBDB-T-2Cl is much simpler than that of PBDB-T-2F. The two polymers have very similar optoelectronic and morphological properties, except the chlorinated polymer possess lower molecular energy levels than the fluorinated one. As a result, the PBDB-T-2Cl-based PSCs exhibit higher open circuit voltage ( $V_{oc}$ ) than the PBDB-T-2F-based devices, leading to an outstanding power conversion efficiency of over 14%. This work establishes a more economical design paradigm of replacing fluorine with chlorine for preparing highly efficient polymer donors.

E-mail:hjhzl@iccas.ac.cn

3、被引频次: 522

题目: ADDITIVE MANUFACTURING OF METALLIC COMPONENTS - PROCESS, STRUCTURE AND PROPERTIES

作者: DEBROY, T;WEI, HL;ZUBACK, JS;MUKHERJEE, T;ELMER, JW;MILEWSKI, JO;BEESE, AM;WILSON-HEID, A;DE, A;ZHANG, W

出处: PROGRESS IN MATERIALS SCIENCE 92: 112-224 MAR 2018

地址: PENN STATE UNIV, DEPT MAT SCI & ENGN, UNIVERSITY PK, PA 16802 USA;LAWRENCE LIVERMORE NATL LAB, MAT ENGN DIV, LIVERMORE, CA USA;APEX3D LLC, SANTA FE, NM USA;INDIAN INST TECHNOL, DEPT MECH ENGN, BOMBAY, MAHARASHTRA, INDIA;OHIO STATE UNIV, DEPT MAT SCI & ENGN, 116 W 19TH AVE, COLUMBUS, OH 43210 USA

摘要: Since its inception, significant progress has been made in understanding additive manufacturing (AM) processes and the structure and properties of the fabricated metallic components. Because the field is rapidly evolving, a periodic critical assessment of our understanding is useful and this paper seeks to address this need. It covers the emerging research on AM of metallic materials and provides a comprehensive overview of the physical processes and the underlying science of metallurgical structure and properties of the deposited parts. The uniqueness of this review includes substantive discussions on refractory alloys, precious metals and compositionally graded alloys, a succinct comparison of AM with welding and a critical examination of the printability of various engineering alloys based on experiments and theory. An assessment of the status of the field, the gaps in the scientific understanding and the research needs for the expansion of AM of metallic components are provided. (C) 2017 Elsevier Ltd. All rights reserved.

E-mail:rtd1@psu.edu

4、被引频次: 421

题目: PEROVSKITE LIGHT-EMITTING DIODES WITH EXTERNAL QUANTUM EFFICIENCY EXCEEDING 20 PER CENT

作者: LIN, KB;XING, J;QUAN, LN;DE ARQUER, FPG;GONG, XW;LU, JX;XIE, LQ;ZHAO,

WJ;ZHANG, D;YAN, CZ;LI, WQ;LIU, XY;LU, Y;KIRMAN, J;SARGENT, EH;XIONG, QH;WEI, ZH

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地址: HUAQIAO UNIV, COLL MAT SCI & ENGN, MINIST EDUC, ENGN RES CTR ENVIRONM FRIENDLY FUNCT MAT, XIAMEN, PEOPLES R CHINA;NANYANG TECHNOL UNIV, SCH PHYS & MATH SCI, DIV PHYS & APPL PHYS, SINGAPORE, SINGAPORE;UNIV TORONTO, DEPT ELECT & COMP ENGN, TORONTO, ON, CANADA

摘要: Metal halide perovskite materials are an emerging class of solution-processable semiconductors with considerable potential for use in optoelectronic devices(1-3). For example, light-emitting diodes (LEDs) based on these materials could see application in flatpanel displays and solid-state lighting, owing to their potential to be made at low cost via facile solution processing, and could provide tunable colours and narrow emission line widths at high photoluminescence quantum yields(4-8). However, the highest reported external quantum efficiencies of green-and red-light-emitting perovskite LEDs are around 14 per cent(7,9) and 12 per cent(8), respectively-still well behind the performance of organic LEDs(10-12) and inorganic quantum dot LEDs(13). Here we describe visible-light-emitting perovskite LEDs that surpass the quantum efficiency milestone of 20 per cent. This achievement stems from a new strategy for managing the compositional distribution in the device-an approach that simultaneously provides high luminescence and balanced charge injection. Specifically, we mixed a presynthesized CsPbBr<sub>3</sub> perovskite with a MABr additive (where MA is CH<sub>3</sub>NH<sub>3</sub>), the differing solubilities of which yield sequential crystallization into a CsPbBr<sub>3</sub>/MABr quasi-core/shell structure. The MABr shell passivates the nonradiative defects that would otherwise be present in CsPbBr<sub>3</sub> crystals, boosting the photoluminescence quantum efficiency, while the MABr capping layer enables balanced charge injection. The resulting 20.3 per cent external quantum efficiency represents a substantial step towards the practical application of perovskite LEDs in lighting and display.

E-mail:ted.sargent@utoronto.ca; qihua@ntu.edu.sg; weizhanhua@hqu.edu.cn

5、被引频次: 326

题目: SKIN ELECTRONICS FROM SCALABLE FABRICATION OF AN INTRINSICALLY STRETCHABLE TRANSISTOR ARRAY

作者: WANG, SH;XU, J;WANG, WC;WANG, GJN;RASTAK, R;MOLINA-LOPEZ, F;CHUNG, JW;NIU, SM;FEIG, VR;LOPEZ, J;LEI, T;KWON, SK;KIM, Y;FOUDEH, AM;EHRlich, A;GASPERINI, A;YUN, Y;MURMANN, B;TOK, JBH;BAO, ZA

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地址: STANFORD UNIV, DEPT CHEM ENGN, STANFORD, CA 94305 USA;STANFORD UNIV, DEPT MAT SCI & ENGN, STANFORD, CA 94305 USA;STANFORD UNIV, DEPT CIVIL & ENVIRONM ENGN, STANFORD, CA 94305 USA;SAMSUNG ADV INST TECHNOL, SUWON 443803, GYEONGGI DO, SOUTH KOREA;GYEONGSANG NATL UNIV, DEPT MAT ENGN & CONVERGENCE TECHNOL & ERI, JINJU 660701, SOUTH KOREA;STANFORD UNIV, DEPT ELECT ENGN, STANFORD, CA 94305 USA

摘要: Skin-like electronics that can adhere seamlessly to human skin or within the body are highly desirable for applications such as health monitoring(1,2), medical treatment(3,4), medical implants(5) and biological studies(6,7), and for technologies that include human-machine interfaces, soft robotics

and augmented reality(8,9). Rendering such electronics soft and stretchable-like human skin-would make them more comfortable to wear, and, through increased contact area, would greatly enhance the fidelity of signals acquired from the skin. Structural engineering of rigid inorganic and organic devices has enabled circuit-level stretchability, but this requires sophisticated fabrication techniques and usually suffers from reduced densities of devices within an array(2,10-12). We reasoned that the desired parameters, such as higher mechanical deformability and robustness, improved skin compatibility and higher device density, could be provided by using intrinsically stretchable polymer materials instead. However, the production of intrinsically stretchable materials and devices is still largely in its infancy(13-15): such materials have been reported(11,16-19), but functional, intrinsically stretchable electronics have yet to be demonstrated owing to the lack of a scalable fabrication technology. Here we describe a fabrication process that enables high yield and uniformity from a variety of intrinsically stretchable electronic polymers. We demonstrate an intrinsically stretchable polymer transistor array with an unprecedented device density of 347 transistors per square centimetre. The transistors have an average charge-carrier mobility comparable to that of amorphous silicon, varying only slightly (within one order of magnitude) when subjected to 100 per cent strain for 1,000 cycles, without current-voltage hysteresis. Our transistor arrays thus constitute intrinsically stretchable skin electronics, and include an active matrix for sensory arrays, as well as analogue and digital circuit elements. Our process offers a general platform for incorporating other intrinsically stretchable polymer materials, enabling the fabrication of next-generation stretchable skin electronic devices.

E-mail:zbao@stanford.edu

#### 6、被引频次：311

题目：30 YEARS OF LITHIUM-ION BATTERIES

作者：LI, M;LU, J;CHEN, ZW;AMINE, K

出处：ADVANCED MATERIALS 30 (33): - AUG 16 2018

地址：ARGONNE NATL LAB, CHEM SCI & ENGN DIV, 9700 CASS AVE, LEMONT, IL 60439 USA;UNIV WATERLOO, DEPT CHEM ENGN, WATERLOO INST NANOTECHNOL, 200 UNIV AVE WEST, WATERLOO, ON N2L 3G1, CANADA;IMAM ABDULRAHMAN BIN FAISAL UNIV, INST RES & MED CONSULTAT, DAMMAM 34212, SAUDI ARABIA;STANFORD UNIV, MAT SCI & ENGN, STANFORD, CA 94305 USA

摘要：Over the past 30 years, significant commercial and academic progress has been made on Li-based battery technologies. From the early Li-metal anode iterations to the current commercial Li-ion batteries (LIBs), the story of the Li-based battery is full of breakthroughs and back tracing steps. This review will discuss the main roles of material science in the development of LIBs. As LIB research progresses and the materials of interest change, different emphases on the different subdisciplines of material science are placed. Early works on LIBs focus more on solid state physics whereas near the end of the 20th century, researchers began to focus more on the morphological aspects (surface coating, porosity, size, and shape) of electrode materials. While it is easy to point out which specific cathode and anode materials are currently good candidates for the next-generation of batteries, it is difficult to explain exactly why those are chosen. In this review, for the reader a complete developmental story of LIB should be clearly drawn, along with an explanation of the reasons responsible for the various technological shifts. The review will end with a statement of

caution for the current modern battery research along with a brief discussion on beyond lithium-ion battery chemistries.

E-mail: junlu@anl.gov; zhwchen@uwaterloo.ca; amine@anl.gov

7、被引频次: 310

题目: GENESIS, CHALLENGES AND OPPORTUNITIES FOR COLLOIDAL LEAD HALIDE PEROVSKITE NANOCRYSTALS

作者: AKKERMAN, QA; RAINO, G; KOVALENKO, MV; MANNA, L

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地址: IST ITALIANO TECNOLOGIA, NANOCHEM DEPT, GENOVA, ITALY; UNIV GENOVA, GENOVA, ITALY; SWISS FED INST TECHNOL, DEPT CHEM & APPL BIOSCI, INST INORGAN CHEM, ZURICH, SWITZERLAND; EMPA SWISS FED LABS MAT SCI & TECHNOL, LAB THIN FILMS & PHOTOVOLTA, DUBENDORF, SWITZERLAND; DELFT UNIV TECHNOL, KAVLI INST NANOSCI, DELFT, NETHERLANDS; DELFT UNIV TECHNOL, DEPT CHEM ENGN, DELFT, NETHERLANDS

摘要: Lead halide perovskites (LHPs) in the form of nanometre-sized colloidal crystals, or nanocrystals (NCs), have attracted the attention of diverse materials scientists due to their unique optical versatility, high photoluminescence quantum yields and facile synthesis. LHP NCs have a 'soft' and predominantly ionic lattice, and their optical and electronic properties are highly tolerant to structural defects and surface states. Therefore, they cannot be approached with the same experimental mindset and theoretical framework as conventional semiconductor NCs. In this Review, we discuss LHP NCs historical and current research pursuits, challenges in applications, and the related present and future mitigation strategies explored.

E-mail: mvkovalenko@ethz.ch; liberato.manna@iit.it

8、被引频次: 310

题目: STABLE METAL-ORGANIC FRAMEWORKS: DESIGN, SYNTHESIS, AND APPLICATIONS

作者: YUAN, S; FENG, L; WANG, KC; PANG, JD; BOSCH, M; LOLLAR, C; SUN, YJ; QIN, JS; YANG, XY; ZHANG, P; WANG, Q; ZOU, LF; ZHANG, YM; ZHANG, LL; FANG, Y; LI, JL; ZHOU, HC

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地址: TEXAS A&M UNIV, DEPT CHEM, COLLEGE STN, TX 77843 USA; TEXAS A&M UNIV, DEPT MAT SCI & ENGN, COLLEGE STN, TX 77843 USA

摘要: Metal-organic frameworks (MOFs) are an emerging class of porous materials with potential applications in gas storage, separations, catalysis, and chemical sensing. Despite numerous advantages, applications of many MOFs are ultimately limited by their stability under harsh conditions. Herein, the recent advances in the field of stable MOFs, covering the fundamental mechanisms of MOF stability, design, and synthesis of stable MOF architectures, and their latest applications are reviewed. First, key factors that affect MOF stability under certain chemical environments are introduced to guide the design of robust structures. This is followed by a short review of synthetic strategies of stable MOFs including modulated synthesis and postsynthetic modifications. Based on the fundamentals of MOF stability, stable MOFs are classified into two

categories: high-valency metal-carboxylate frameworks and low-valency metal-azolate frameworks. Along this line, some representative stable MOFs are introduced, their structures are described, and their properties are briefly discussed. The expanded applications of stable MOFs in Lewis/Bronsted acid catalysis, redox catalysis, photocatalysis, electrocatalysis, gas storage, and sensing are highlighted. Overall, this review is expected to guide the design of stable MOFs by providing insights into existing structures, which could lead to the discovery and development of more advanced functional materials.

E-mail:zhou@chem.tamu.edu

9、被引频次: 306

题目: OVER 14% EFFICIENCY IN ORGANIC SOLAR CELLS ENABLED BY CHLORINATED NONFULLERENE SMALL-MOLECULE ACCEPTORS

作者: ZHANG, H;YAO, HF;HOU, JX;ZHU, J;ZHANG, JQ;LI, WN;YU, RN;GAO, BW;ZHANG, SQ;HOU, JH

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地址: CHINESE ACAD SCI, STATE KEY LAB POLYMER PHYS & CHEM, CAS RES EDUC CTR EXCELLENCE MOL SCI, BEIJING NATL LAB MOL SCI, INST CHEM, BEIJING 100190, PEOPLES R CHINA; UNIV CHINESE ACAD SCI, SCH CHEM SCI, BEIJING 100049, PEOPLES R CHINA; HEBEI UNIV ENGN, COLL MAT SCI & ENGN, DEPT COMPOSITE MAT & ENGN, HANDAN 056038, PEOPLES R CHINA; NATL CTR NANOSCI & TECHNOL, KEY LAB NANOSYST & HIERARCH FABRICAT, BEIJING 100190, PEOPLES R CHINA

摘要: To make organic solar cells (OSCs) more competitive in the diverse photovoltaic cell technologies, it is very important to demonstrate that OSCs can achieve very good efficiencies and that their cost can be reduced. Here, a pair of nonfullerene small-molecule acceptors, IT-2Cl and IT-4Cl, is designed and synthesized by introducing easy-synthesis chlorine substituents onto the indacenodithieno[3,2-b]thiophene units. The unique feature of the large dipole moment of the C-Cl bond enhances the intermolecular charge-transfer effect between the donor-acceptor structures, and thus expands the absorption and down shifts the molecular energy levels. Meanwhile, the introduction of C-Cl also causes more pronounced molecular stacking, which also helps to expand the absorption spectrum. Both of the designed OSCs devices based on two acceptors can deliver a power conversion efficiency (PCE) greater than 13% when blended with a polymer donor with a low-lying highest occupied molecular orbital level. In addition, since IT-2Cl and IT-4Cl have very good compatibility, a ternary OSC device integrating these two acceptors is also fabricated and obtains a PCE greater than 14%. Chlorination demonstrates effective ability in enhancing the device performance and facile synthesis route, which both deserve further exploitation in the modification of photovoltaic materials.

E-mail:yaohf@iccas.ac.cn; hjhzl@iccas.ac.cn

10、被引频次: 291

题目: ENHANCED PHOTOVOLTAGE FOR INVERTED PLANAR HETEROJUNCTION PEROVSKITE SOLAR CELLS

作者: LUO, DY;YANG, WQ;WANG, ZP;SADHANALA, A;HU, Q;SU, R;SHIVANNA, R;TRINDADE, GF;WATTS, JF;XU, ZJ;LIU, TH;CHEN, K;YE, FJ;WU, P;ZHAO, LC;WU, J;TU,

YG;ZHANG, YF;YANG, XY;ZHANG, W;FRIEND, RH;GONG, QH;SNAITH, HJ;ZHU, R

出处: SCIENCE 360 (6396): 1442-1446 JUN 29 2018

地址: PEKING UNIV, DEPT PHYS, STATE KEY LAB ARTIFICIAL MICROSTRUCT & MESOSCOP P, BEIJING 100871, PEOPLES R CHINA;COLLABORAT INNOVAT CTR QUANTUM MATTER, BEIJING 100871, PEOPLES R CHINA;UNIV OXFORD, DEPT PHYS, CLARENDON LAB, PARKS RD, OXFORD OX1 3PU, ENGLAND;CAVENDISH LAB, JJ THOMSON AVE, CAMBRIDGE CB3 0HE, ENGLAND;UNIV SURREY, FAC ENGN & PHYS SCI, SURFACE ANAL LAB, GUILDFORD GU2 7XH, SURREY, ENGLAND;UNIV SURREY, ADV TECHNOL INST, GUILDFORD GU2 7XH, SURREY, ENGLAND;SHANXI UNIV, COLLABORAT INNOVAT CTR EXTREME OPT, TAIYUAN 030006, SHANXI, PEOPLES R CHINA

摘要: The highest power conversion efficiencies (PCEs) reported for perovskite solar cells (PSCs) with inverted planar structures are still inferior to those of PSCs with regular structures, mainly because of lower open-circuit voltages ( $V_{oc}$ ). Here we report a strategy to reduce nonradiative recombination for the inverted devices, based on a simple solution-processed secondary growth technique. This approach produces a wider bandgap top layer and a more n-type perovskite film, which mitigates nonradiative recombination, leading to an increase in  $V_{oc}$  by up to 100 millivolts. We achieved a high  $V_{oc}$  of 1.21 volts without sacrificing photocurrent, corresponding to a voltage deficit of 0.41 volts at a bandgap of 1.62 electron volts. This improvement led to a stabilized power output approaching 21% at the maximum power point.

E-mail:wz0003@surrey.ac.uk; henry.snaith@physics.ox.ac.uk; iamzhurui@pku.edu.cn

11、被引频次: 291

题目: PEROVSKITE LIGHT-EMITTING DIODES BASED ON SPONTANEOUSLY FORMED SUBMICROMETRE-SCALE STRUCTURES

作者: CAO, Y;WANG, NN;TIAN, H;GUO, JS;WEI, YQ;CHEN, H;MIAO, YF;ZOU, W;PAN, K;HE, YR;CAO, H;KE, Y;XU, MM;WANG, Y;YANG, M;DU, K;FU, ZW;KONG, DC;DAI, DX;JIN, YZ;LI, GQ;LI, H;PENG, QM;WANG, JP;HUANG, W

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地址: NANJING TECH UNIV NANJINGTECH, KLOFE, NANJING, JIANGSU, PEOPLES R CHINA;NANJING TECH UNIV NANJINGTECH, JIANGSU NATL SYNERGET INNOVAT CTR ADV MAT SICAM, IAM, NANJING, JIANGSU, PEOPLES R CHINA;ZHEJIANG UNIV, CTR ELECTRON MICROSCOPE, SCH MAT SCI & ENGN, STATE KEY LAB SILICON MAT, HANGZHOU, ZHEJIANG, PEOPLES R CHINA;ZHEJIANG UNIV, CTR OPT & ELECTROMAGNET RES, STATE KEY LAB MODERN OPT INSTRUMENTAT, ZHEJIANG PROV KEY LAB SENSING TECHNOL, HANGZHOU, ZHEJIANG, PEOPLES R CHINA;ZHEJIANG UNIV, CTR CHEM HIGH PERFORMANCE & NOVEL MAT, STATE KEY LAB SILICON MAT, HANGZHOU, ZHEJIANG, PEOPLES R CHINA;ZHEJIANG UNIV, DEPT CHEM, HANGZHOU, ZHEJIANG, PEOPLES R CHINA;NANJING UNIV POSTS & TELECOMMUN, INST ADV MAT, KEY LAB ORGAN ELECT & INFORMAT DISPLAYS, NANJING, JIANGSU, PEOPLES R CHINA;NPU, SIFE, XIAN, SHAANXI, PEOPLES R CHINA

摘要: Light-emitting diodes (LEDs), which convert electricity to light, are widely used in modern society-for example, in lighting, flat-panel displays, medical devices and many other situations.



Generally, the efficiency of LEDs is limited by nonradiative recombination (whereby charge carriers recombine without releasing photons) and light trapping(1-3). In planar LEDs, such as organic LEDs, around 70 to 80 per cent of the light generated from the emitters is trapped in the device(4,5), leaving considerable opportunity for improvements in efficiency. Many methods, including the use of diffraction gratings, low-index grids and buckling patterns, have been used to extract the light trapped in LEDs(6-9). However, these methods usually involve complicated fabrication processes and can distort the light-output spectrum and directionality(6,7). Here we demonstrate efficient and high-brightness electroluminescence from solution-processed perovskites that spontaneously form submicrometre-scale structures, which can efficiently extract light from the device and retain wavelength-and viewing-angle-independent electroluminescence. These perovskites are formed simply by introducing amino-acid additives into the perovskite precursor solutions. Moreover, the additives can effectively passivate perovskite surface defects and reduce nonradiative recombination. Perovskite LEDs with a peak external quantum efficiency of 20.7 per cent (at a current density of 18 milliamperes per square centimetre) and an energy-conversion efficiency of 12 per cent (at a high current density of 100 milliamperes per square centimetre) can be achieved-values that approach those of the best-performing organic LEDs.

E-mail:iamjpwang@njtech.edu; iamwhuang@nwpu.edu.cn

12、被引频次: 283

题目: ADDITIVE MANUFACTURING (3D PRINTING): A REVIEW OF MATERIALS, METHODS, APPLICATIONS AND CHALLENGES

作者: NGO, TD;KASHANI, A;IMBALZANO, G;NGUYEN, KTQ;HUI, D

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地址: UNIV MELBOURNE, DEPT INFRASTRUCT ENGN, MELBOURNE, VIC 3010, AUSTRALIA;UNIV NEW ORLEANS, DEPT MECH ENGN, COMPOSITE MAT RES LAB, NEW ORLEANS, LA 70148 USA

摘要: Freedom of design, mass customisation, waste minimisation and the ability to manufacture complex structures, as well as fast prototyping, are the main benefits of additive manufacturing (AM) or 3D printing. A comprehensive review of the main 3D printing methods, materials and their development in trending applications was carried out. In particular, the revolutionary applications of AM in biomedical, aerospace, buildings and protective structures were discussed. The current state of materials development, including metal alloys, polymer composites, ceramics and concrete, was presented. In addition, this paper discussed the main processing challenges with void formation, anisotropic behaviour, the limitation of computer design and layer-by-layer appearance. Overall, this paper gives an overview of 3D printing, including a survey on its benefits and drawbacks as a benchmark for future research and development.

E-mail:dtngo@unimelb.edu.au; kashani.a@unimelb.edu.au

13、被引频次: 281

题目: METAL-ORGANIC FRAMEWORKS AS PLATFORMS FOR CATALYTIC APPLICATIONS

作者: JIAO, L;WANG, Y;JIANG, HL;XU, Q

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地址: UNIV SCI & TECHNOL CHINA, HEFEI NATL LAB PHYS SCI MICROSCALE,



COLLABORAT INNOVAT CTR SUZHOU NANOSCI & TECHNOL, DEPT CHEM,CAS KEY LAB SOFT MATTER CHEM, HEFEI 230026, ANHUI, PEOPLES R CHINA;NATL INST ADV IND SCI & TECHNOL, RES INST ELECTROCHEM ENERGY, 1-8-31 MIDORIGAOKA, IKEDA, OSAKA 5638577, JAPAN;KYOTO UNIV, AIST, CHEM ENERGY MAT OPEN INNOVAT LAB CHEM OIL, SAKYO KU, KYOTO 6068501, JAPAN

摘要: Metal-organic frameworks (MOFs), also called porous coordination polymers, represent a class of crystalline porous materials built from organic linkers and metal ions/clusters. The unique features of MOFs, including structural diversity and tailorability as well as high surface area, etc., enable them to be a highly versatile platform for potential applications in many fields. Herein, an overview of recent developments achieved in MOF catalysis, including heterogeneous catalysis, photocatalysis, and electrocatalysis over MOFs and MOF-based materials, is provided. The active sites involved in the catalysts are particularly emphasized. The challenges, future trends, and prospects associated with MOFs and their related materials for catalysis are also discussed.

E-mail:jianglab@ustc.edu.cn; q.xu@aist.go.jp

14、被引频次: 275

题目: 3D-2D-0D INTERFACE PROFILING FOR RECORD EFFICIENCY ALL-INORGANIC CSPBBR12 PEROVSKITE SOLAR CELLS WITH SUPERIOR STABILITY

作者: ZHANG, JR;BAI, DL;JIN, ZW;BIAN, H;WANG, K;SUN, J;WANG, Q;LIU, SZ

出处: ADVANCED ENERGY MATERIALS 8 (15): - MAY 25 2018

地址: SHAANXI NORMAL UNIV, SHAANXI ENGN LAB ADV ENERGY TECHNOL, KEY LAB APPL SURFACE & COLLOID CHEM,MINIST EDUC, SHAANXI KEY LAB ADV ENERGY DEVICES,SCH MAT SCI &, XIAN 710119, SHAANXI, PEOPLES R CHINA;DALIAN INST CHEM PHYS, ICHEM, DALIAN NATL LAB CLEAN ENERGY, DALIAN 116023, PEOPLES R CHINA

摘要: All-inorganic CsPbBr<sub>2</sub> perovskite has great advantages in terms of ambient phase stability and suitable band gap (1.91 eV) for photovoltaic applications. However, the typically used structure causes reduced device performance, primarily due to the large recombination at the interface between the perovskite, and the hole-extraction layer (HEL). In this paper, an efficient CsPbBr<sub>2</sub> perovskite solar cell (PSC) with a dimensionally graded heterojunction is reported, in which the CsPbBr<sub>2</sub> material is distributed within bulk-nanosheet-quantum dots or 3D-2D-0D dimension-profiled interface structure so that the energy alignment is optimized in between the valence and conduction bands of both CsPbBr<sub>2</sub> and the HEL layers. Specifically, the valence-/conduction-band edge is leveraged to bend with synergistic advantages: the graded combination enhances the hole extraction and conduction efficiency with effectively decreased recombination loss during the hole-transfer process, leading to an enhanced built-in electric field, hence a high V-OC of as much as 1.19 V. The profiled structure induces continuously upshifted energy levels, resulting in a higher J(SC) of as much as 12.93 mA cm<sup>-2</sup> and fill factor as high as 80.5%, and therefore record power conversion efficiency (PCE) of 12.39%. As far as it is known, this is the highest PCE for CsPbBr<sub>2</sub> perovskite-based PSC.

E-mail:jinzhiwen@snnu.edu.cn; wangqian16@snnu.edu.cn; szliu@dicp.ac.cn

15、被引频次：261

题目：TWO-DIMENSIONAL MATERIALS FROM HIGH-THROUGHPUT COMPUTATIONAL EXFOLIATION OF EXPERIMENTALLY KNOWN COMPOUNDS

作者：MOUNET, N;GIBERTINI, M;SCHWALLER, P;CAMPI, D;MERKYS, A;MARRAZZO, A;SOHIER, T;CASTELLI, IE;CEPELLOTTI, A;PIZZI, G;MARZARI, N

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地址：ECOLE POLYTECH FED LAUSANNE, THEORY & SIMULAT MAT THEOS, LAUSANNE, SWITZERLAND;ECOLE POLYTECH FED LAUSANNE, NATL CTR COMPUTAT DESIGN & DISCOVERY NOVEL MAT MA, LAUSANNE, SWITZERLAND;VILNIUS UNIV, INST BIOTECHNOL, VILNIUS, LITHUANIA

摘要：Two-dimensional (2D) materials have emerged as promising candidates for next-generation electronic and optoelectronic applications. Yet, only a few dozen 2D materials have been successfully synthesized or exfoliated. Here, we search for 2D materials that can be easily exfoliated from their parent compounds. Starting from 108,423 unique, experimentally known 3D compounds, we identify a subset of 5,619 compounds that appear layered according to robust geometric and bonding criteria. High-throughput calculations using van der Waals density functional theory, validated against experimental structural data and calculated random phase approximation binding energies, further allowed the identification of 1,825 compounds that are either easily or potentially exfoliable. In particular, the subset of 1,036 easily exfoliable cases provides novel structural prototypes and simple ternary compounds as well as a large portfolio of materials to search from for optimal properties. For a subset of 258 compounds, we explore vibrational, electronic, magnetic and topological properties, identifying 56 ferromagnetic and antiferromagnetic systems, including half-metals and half-semiconductors.

E-mail: nicolas.mounet@polytechnique.org; nicola.marzari@epfl.ch

16、被引频次：226

题目：PROGRESS AND CHALLENGES TOWARDS TARGETED DELIVERY OF CANCER THERAPEUTICS

作者：ROSENBLUM, D;JOSHI, N;TAO, W;KARP, JM;PEER, D

出处：NATURE COMMUNICATIONS 9: - APR 12 2018

地址：TEL AVIV UNIV, LAB PRECIS NANOMED, SCH MOL CELL BIOL & BIOTECHNOL, IBY & ALADAR FLEIS, GEORGE S WISE FAC LIFE SCI, DEPT MAT SCI & ENGN, IL-6997801 TEL AVIV, ISRAEL; TEL AVIV UNIV, CANC BIOL RES CTR, CTR NANOSCI & NANOTECHNOL, IL-6997801 TEL AVIV, ISRAEL; HARVARD MED SCH, BRIGHAM & WOMENS HOSP, DEPT MED, CTR NANOMED, CAMBRIDGE, MA 02139 USA; HARVARD MED SCH, BRIGHAM & WOMENS HOSP, DEPT MED, DIV ENGN MED, CAMBRIDGE, MA 02139 USA; HARVARD MASSACHUSETTS DIV HLTH SCI & TECHNOL, CAMBRIDGE, MA 02139 USA; HARVARD MED SCH, CTR NANOMED, BOSTON, MA 02115 USA; HARVARD MED SCH, DEPT ANESTHESIOLOG, BOSTON, MA 02115 USA; HARVARD MED SCH, BRIGHAM & WOMENS HOSP, BOSTON, MA 02115 USA

摘要：Targeted delivery approaches for cancer therapeutics have shown a steep rise over the past few decades. However, compared to the plethora of successful pre-clinical studies, only 15 passively targeted nanocarriers (NCs) have been approved for clinical use and none of the actively targeted

NCs have advanced past clinical trials. Herein, we review the principles behind targeted delivery approaches to determine potential reasons for their limited clinical translation and success. We propose criteria and considerations that must be taken into account for the development of novel actively targeted NCs. We also highlight the possible directions for the development of successful tumor targeting strategies.

E-mail:jmkarp@bwh.harvard.edu; peer@tauex.tau.ac.il

17、被引频次: 224

题目: A LIBRARY OF ATOMICALLY THIN METAL CHALCOGENIDES

作者: ZHOU, JD;LIN, JH;HUANG, XW;ZHOU, Y;CHEN, Y;XIA, J;WANG, H;XIE, Y;YU, HM;LEI, JC;WU, D;LIU, FC;FU, QD;ZENG, QS;HSU, CH;YANG, CL;LU, L;YU, T;SHEN, ZX;LIN, H;YAKOBSON, BI;LIU, Q;SUENAGA, K;LIU, GT;LIU, Z

出处: NATURE 556 (7701): 355-+ APR 19 2018

地址: NANYANG TECHNOL UNIV, SCH MAT SCI & ENGN, CTR PROGRAMMABLE MAT, SINGAPORE, SINGAPORE;NATL INST ADV IND SCI & TECHNOL, TSUKUBA, IBARAKI, JAPAN;CHINESE ACAD SCI, BEIJING NATL LAB CONDENSED MATTER PHYS, INST PHYS, BEIJING, PEOPLES R CHINA;CHINESE ACAD SCI, SHANGHAI INST CERAM, STATE KEY LAB HIGH PERFORMANCE CERAM & SUPERFINE, SHANGHAI, PEOPLES R CHINA;NANYANG TECHNOL UNIV, SCH PHYS & MATH SCI, DIV PHYS & APPL PHYS, SINGAPORE, SINGAPORE;RICE UNIV, DEPT MAT SCI & NANOENGN, HOUSTON, TX USA;RICE UNIV, DEPT CHEM, HOUSTON, TX USA;EAST CHINA UNIV SCI & TECHNOL, SCH MAT SCI & ENGN, SHANGHAI, PEOPLES R CHINA;NATL UNIV SINGAPORE, CTR ADV MAT 2D, SINGAPORE, SINGAPORE;NATL UNIV SINGAPORE, GRAPHENE RES CTR, SINGAPORE, SINGAPORE;NATL UNIV SINGAPORE, DEPT PHYS, SINGAPORE, SINGAPORE;COLLABORAT INNOVAT CTR QUANTUM MATTER, BEIJING, PEOPLES R CHINA;ACAD SINICA, INST PHYS, TAIPEI, TAIWAN;NANYANG TECHNOL UNIV, SCH ELECT & ELECT ENGN, CTR MICRO NANO ELECT NOVITAS, SINGAPORE, SINGAPORE;CINTRA CNRS NTU THALES, UMI 3288, RES TECHNO PLAZA, SINGAPORE, SINGAPORE;NANYANG ENVIRONM & WATER RES INST, ENVIRONM CHEM & MAT CTR, SINGAPORE, SINGAPORE

摘要: Investigations of two-dimensional transition-metal chalcogenides (TMCs) have recently revealed interesting physical phenomena, including the quantum spin Hall effect(1,2), valley polarization(3,4) and two-dimensional superconductivity(5), suggesting potential applications for functional devices(6-10). However, of the numerous compounds available, only a handful, such as Mo- and W-based TMCs, have been synthesized, typically via sulfurization(11-15), selenization(16,17) and tellurization(18) of metals and metal compounds. Many TMCs are difficult to produce because of the high melting points of their metal and metal oxide precursors. Molten-salt-assisted methods have been used to produce ceramic powders at relatively low temperature(19) and this approach(20) was recently employed to facilitate the growth of monolayer WS<sub>2</sub> and WSe<sub>2</sub>. Here we demonstrate that molten-salt-assisted chemical vapour deposition can be broadly applied for the synthesis of a wide variety of two-dimensional (atomically thin) TMCs. We synthesized 47 compounds, including 32 binary compounds (based on the transition metals Ti, Zr, Hf, V, Nb, Ta, Mo, W, Re, Pt, Pd and Fe), 13 alloys (including 11 ternary, one quaternary and one

quinary), and two heterostructured compounds. We elaborate how the salt decreases the melting point of the reactants and facilitates the formation of intermediate products, increasing the overall reaction rate. Most of the synthesized materials in our library are useful, as supported by evidence of superconductivity in our monolayer NbSe<sub>2</sub> and MoTe<sub>2</sub> samples(21,22) and of high mobilities in MoS<sub>2</sub> and ReS<sub>2</sub>. Although the quality of some of the materials still requires development, our work opens up opportunities for studying the properties and potential application of a wide variety of two-dimensional TMCs.

E-mail:lin.junhao.stem@gmail.com; gtliu@iphy.ac.cn; z.liu@ntu.edu.sg

18、被引频次: 220

题目: OVER 16% EFFICIENCY ORGANIC PHOTOVOLTAIC CELLS ENABLED BY A CHLORINATED ACCEPTOR WITH INCREASED OPEN-CIRCUIT VOLTAGES

作者: CUI, Y;YAO, HF;ZHANG, JQ;ZHANG, T;WANG, YM;HONG, L;XIAN, KH;XU, BW;ZHANG, SQ;PENG, J;WEI, ZX;GAO, F;HOU, JH

出处: NATURE COMMUNICATIONS 10: - JUN 7 2019

地址: CHINESE ACAD SCI, INST CHEM, CAS RES EDUC CTR EXCELLENCE MOL SCI BNLMS, STATE KEY LAB POLYMER PHYS & CHEM,BEIJING NATL LA, BEIJING 100190, PEOPLES R CHINA;UNIV CHINESE ACAD SCI, BEIJING 100049, PEOPLES R CHINA;NATL CTR NANOSCI & TECHNOL, KEY LAB NANOSYST & HIERARCH FABRICAT, BEIJING 100190, PEOPLES R CHINA;LINKOPING UNIV, DEPT PHYS CHEM & BIOL, SE-58183 LINKOPING, SWEDEN;UNIV SCI & TECHNOL BEIJING, SCH CHEM & BIOL ENGN, BEIJING 100083, PEOPLES R CHINA;ORGANTEC LTD, BEIJING 102200, PEOPLES R CHINA

摘要: Broadening the optical absorption of organic photovoltaic (OPV) materials by enhancing the intramolecular push-pull effect is a general and effective method to improve the power conversion efficiencies of OPV cells. However, in terms of the electron acceptors, the most common molecular design strategy of halogenation usually results in down-shifted molecular energy levels, thereby leading to decreased open-circuit voltages in the devices. Herein, we report a chlorinated non-fullerene acceptor, which exhibits an extended optical absorption and meanwhile displays a higher voltage than its fluorinated counterpart in the devices. This unexpected phenomenon can be ascribed to the reduced non-radiative energy loss (0.206 eV). Due to the simultaneously improved short-circuit current density and open-circuit voltage, a high efficiency of 16.5% is achieved. This study demonstrates that finely tuning the OPV materials to reduce the bandgap-voltage offset has great potential for boosting the efficiency.

E-mail:yaohf@iccas.ac.cn

19、被引频次: 207

题目: HIGH EFFICIENCY PLANAR-TYPE PEROVSKITE SOLAR CELLS WITH NEGLIGIBLE HYSTERESIS USING EDTA-COMPLEXED SNO<sub>2</sub>

作者: YANG, D;YANG, RX;WANG, K;WU, CC;ZHU, XJ;FENG, JS;REN, XD;FANG, GJ;PRIYA, S;LIU, SZ

出处: NATURE COMMUNICATIONS 9: - AUG 13 2018

地址: SHAANXI NORMAL UNIV, SCH MAT SCI & ENGN, KEY LAB APPL SURFACE & COLLOID CHEM, MINIST EDUC,SHAANXI ENGN LAB ADV ENERGY TECHNOL, XIAN

710119, SHAANXI, PEOPLES R CHINA; VIRGINIA TECH, CTR ENERGY HARVESTING MAT & SYST CEHMS, BLACKSBURG, VA 24061 USA; WUHAN UNIV, KEY LAB ARTIFICIAL MICRO & NANO STRUCT, MINIST EDUC CHINA, SCH PHYS & TECHNOL, WUHAN 430072, PEOPLES R CHINA; CHINESE ACAD SCI, DALIAN INST CHEM PHYS, ICHEM, DALIAN NATL LAB CLEAN ENERGY, 457 ZHONGSHAN RD, DALIAN 116023, PEOPLES R CHINA

摘要: Even though the mesoporous-type perovskite solar cell (PSC) is known for high efficiency, its planar-type counterpart exhibits lower efficiency and hysteretic response. Herein, we report success in suppressing hysteresis and record efficiency for planar-type devices using EDTA-complexed tin oxide (SnO<sub>2</sub>) electron-transport layer. The Fermi level of EDTA-complexed SnO<sub>2</sub> is better matched with the conduction band of perovskite, leading to high open-circuit voltage. Its electron mobility is about three times larger than that of the SnO<sub>2</sub>. The record power conversion efficiency of planar-type PSCs with EDTA-complexed SnO<sub>2</sub> increases to 21.60% (certified at 21.52% by Newport) with negligible hysteresis. Meanwhile, the low-temperature processed EDTA-complexed SnO<sub>2</sub> enables 18.28% efficiency for a flexible device. Moreover, the unsealed PSCs with EDTA-complexed SnO<sub>2</sub> degrade only by 8% exposed in an ambient atmosphere after 2880 h, and only by 14% after 120 h under irradiation at 100 mW cm<sup>-2</sup>.

E-mail: dongyang@vt.edu; spriya@vt.edu; szliu@dicp.ac.cn

20、被引频次: 205

题目: HIGHLY EFFICIENT SOLAR VAPOUR GENERATION VIA HIERARCHICALLY NANOSTRUCTURED GELS

作者: ZHAO, F; ZHOU, XY; SHI, Y; QIAN, X; ALEXANDER, M; ZHAO, XP; MENDEZ, S; YANG, RG; QU, LT; YU, GH

出处: NATURE NANOTECHNOLOGY 13 (6): 489-+ JUN 2018

地址: UNIV TEXAS AUSTIN, MAT SCI & ENGN PROGRAM, AUSTIN, TX 78712 USA; UNIV TEXAS AUSTIN, DEPT MECH ENGN, AUSTIN, TX 78712 USA; UNIV COLORADO, DEPT MECH ENGN, BOULDER, CO 80309 USA; BEIJING INST TECHNOL, SCH CHEM & CHEM ENGN, KEY LAB PHOTOELECT ELETROPHOTON CONVERS MAT, BEIJING, PEOPLES R CHINA

摘要: Solar vapour generation is an efficient way of harvesting solar energy for the purification of polluted or saline water. However, water evaporation suffers from either inefficient utilization of solar energy or relies on complex and expensive light-concentration accessories. Here, we demonstrate a hierarchically nanostructured gel (HNG) based on polyvinyl alcohol (PVA) and polypyrrole (PPy) that serves as an independent solar vapour generator. The converted energy can be utilized in situ to power the vaporization of water contained in the molecular meshes of the PVA network, where water evaporation is facilitated by the skeleton of the hydrogel. A floating HNG sample evaporated water with a record high rate of 3.2 kg m<sup>-2</sup> h<sup>-1</sup> via 94% solar energy from 1 sun irradiation, and 18-23 litres of water per square metre of HNG was delivered daily when purifying brine water. These values were achievable due to the reduced latent heat of water evaporation in the molecular mesh under natural sunlight.

E-mail: ronggui.yang@colorado.edu; lqu@bit.edu.cn; ghyu@austin.utexas.edu

21、被引频次：204

题目：FULLY TEXTURED MONOLITHIC PEROVSKITE/SILICON TANDEM SOLAR CELLS WITH 25.2% POWER CONVERSION EFFICIENCY

作者：SAHLI, F;WERNER, J;KAMINO, BA;BRAUNINGER, M;MONNARD, R;PAVIET-SALOMON, B;BARRAUD, L;DING, L;LEON, JJD;SACCHETTO, D;CATTANEO, G;DESPEISSE, M;BOCCARD, M;NICOLAY, S;JEANGROS, Q;NIESEN, B;BALLIF, C

出处：NATURE MATERIALS 17 (9): 820-+ SEP 2018

地址：EPFL, INST MICROENGN IMT, PHOTOVOLTA & THIN FILM ELECT LAB PV LAB, NEUCHATEL, SWITZERLAND;CSEM, PV CTR, NEUCHATEL, SWITZERLAND

摘要：Tandem devices combining perovskite and silicon solar cells are promising candidates to achieve power conversion efficiencies above 30% at reasonable costs. State-of-the-art monolithic two-terminal perovskite/silicon tandem devices have so far featured silicon bottom cells that are polished on their front side to be compatible with the perovskite fabrication process. This concession leads to higher potential production costs, higher reflection losses and non-ideal light trapping. To tackle this issue, we developed a top cell deposition process that achieves the conformal growth of multiple compounds with controlled optoelectronic properties directly on the micrometre-sized pyramids of textured monocrystalline silicon. Tandem devices featuring a silicon heterojunction cell and a nanocrystalline silicon recombination junction demonstrate a certified steady-state efficiency of 25.2%. Our optical design yields a current density of 19.5 mA cm<sup>-2</sup> thanks to the silicon pyramidal texture and suggests a path for the realization of 30% monolithic perovskite/silicon tandem devices.

E-mail:florent.sahli@epfl.ch; quentin.jeangros@epfl.ch

22、被引频次：200

题目：NOVEL MOF-DERIVED CO@N-C BIFUNCTIONAL CATALYSTS FOR HIGHLY EFFICIENT ZN-AIR BATTERIES AND WATER SPLITTING

作者：ZHANG, MD;DAI, QB;ZHENG, HG;CHEN, MD;DAI, LM

出处：ADVANCED MATERIALS 30 (10): - MAR 8 2018

地址：NANJING UNIV INFORMAT SCI & TECHNOL, SCH ENVIRONM SCI & ENGN, DEPT CHEM, NANJING 210044, JIANGSU, PEOPLES R CHINA;CASE WESTERN RESERVE UNIV, DEPT MACROMOL SCI & ENGN, CTR ADV SCI & ENGN CARBON CASE4CARBON, 10900 EUCLID AVE, CLEVELAND, OH 44106 USA;NANJING UNIV, SCH CHEM & CHEM ENGN, STATE KEY LAB COORDINAT CHEM, NANJING 210023, JIANGSU, PEOPLES R CHINA;UNIV NEW SOUTH WALES, SCH CHEM ENGN, UNSW CWRU INT JOINT LAB, SYDNEY, NSW 2052, AUSTRALIA

摘要：Metal-organic frameworks (MOFs) and MOF-derived materials have recently attracted considerable interest as alternatives to noble-metal electrocatalysts. Herein, the rational design and synthesis of a new class of Co@N-C materials (C-MOF-C2-T) from a pair of enantiotopic chiral 3D MOFs by pyrolysis at temperature T is reported. The newly developed C-MOF-C2-900 with a unique 3D hierarchical rodlike structure, consisting of homogeneously distributed cobalt nanoparticles encapsulated by partially graphitized N-doped carbon rings along the rod length, exhibits higher electrocatalytic activities for oxygen reduction and oxygen evolution reactions (ORR and OER) than that of commercial Pt/C and RuO<sub>2</sub>, respectively. Primary Zn-air batteries based on C-MOF-900 for the oxygen reduction reaction (ORR) operated at a discharge potential of 1.30 V with a specific

capacity of 741 mA h g(Zn)(-1) under 10 mA cm(-2). Rechargeable Zn-air batteries based on C-MOF-C2-900 as an ORR and OER bifunctional catalyst exhibit initial charge and discharge potentials at 1.81 and 1.28 V (2 mA cm(-2)), along with an excellent cycling stability with no increase in polarization even after 120 h - outperform their counterparts based on noble-metal-based air electrodes. The resultant rechargeable Zn-air batteries are used to efficiently power electrochemical water-splitting systems, demonstrating promising potential as integrated green energy systems for practical applications.

E-mail:zhenghg@nju.edu.cn; liming.dai@case.edu

23、被引频次: 196

题目: POLYDOPAMINE SURFACE CHEMISTRY: A DECADE OF DISCOVERY

作者: RYU, JH;MESSERSMITH, PB;LEE, H

出处: ACS APPLIED MATERIALS & INTERFACES 10 (9): 7523-7540 MAR 7 2018

地址: WONKWANG UNIV, DEPT CARBON FUS ENGN, IKSAN 54538, JEONBUK, SOUTH KOREA;UNIV CALIF BERKELEY, DEPT BIOENGN, 210 HEARST MIN BLDG, BERKELEY, CA 94720 USA;UNIV CALIF BERKELEY, DEPT MAT SCI & ENGN, 210 HEARST MIN BLDG, BERKELEY, CA 94720 USA;LAWRENCE BERKELEY NATL LAB, MAT SCI DIV, BERKELEY, CA 94720 USA;KOREA ADV INST SCI & TECHNOL, DEPT CHEM, 291 UNIV RD, DAEJEON 34141, SOUTH KOREA;KOREA ADV INST SCI & TECHNOL, INST NANOCENTURY, CNIT, 291 UNIV RD, DAEJEON 34141, SOUTH KOREA

摘要: Polydopamine is one of the simplest and most versatile approaches to functionalizing material surfaces, having been inspired by the adhesive nature of catechols and amines in mussel adhesive proteins. Since its first report in 2007, a decade of studies on polydopamine molecular structure, deposition conditions, and physicochemical properties have ensued. During this time, potential uses of polydopamine coatings have expanded in many unforeseen directions, seemingly only limited by the creativity of researchers seeking simple solutions to manipulating surface chemistry. In this review, we describe the current state of the art in polydopamine coating methods, describe efforts underway to uncover and tailor the complex structure and chemical properties of polydopamine, and identify emerging trends and needs in polydopamine research, including the use of dopamine analogs, nitrogen-free polyphenolic precursors, and improvement of coating mechanical properties.

E-mail:philm@berkeley.edu; haeshin@kaist.ac.kr

24、被引频次: 196

题目: APPROACHING THE SCHOTTKY-MOTT LIMIT IN VAN DER WAALS METAL-SEMICONDUCTOR JUNCTIONS

作者: LIU, Y;GUO, J;ZHU, EB;LIAO, L;LEE, SJ;DING, MN;SHAKIR, I;GAMBIN, V;HUANG, Y;DUAN, XF

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地址: UNIV CALIF LOS ANGELES, DEPT MAT SCI & ENGN, LOS ANGELES, CA 90024 USA;HUNAN UNIV, COLL CHEM & CHEM ENGN, STATE KEY LAB CHEMO BIOSENSING & CHEMOMETR, CHANGSHA, HUNAN, PEOPLES R CHINA;HUNAN UNIV, SCH PHYS & ELECT, CHANGSHA, HUNAN, PEOPLES R CHINA;KING SAUD UNIV, COLL ENGN, SUSTAINABLE ENERGY TECHNOL CTR, RIYADH, SAUDI ARABIA;NORTHROP

GRUMMAN CORP, NG NEXT, REDONDO BEACH, CA USA;UNIV CALIF LOS ANGELES, CALIF NANOSYST INST, LOS ANGELES, CA 90095 USA;UNIV CALIF LOS ANGELES, DEPT CHEM & BIOCHEM, 405 HILGARD AVE, LOS ANGELES, CA 90024 USA

摘要: The junctions formed at the contact between metallic electrodes and semiconductor materials are crucial components of electronic and optoelectronic devices(1). Metal-semiconductor junctions are characterized by an energy barrier known as the Schottky barrier, whose height can, in the ideal case, be predicted by the Schottky-Mott rule(2-4) on the basis of the relative alignment of energy levels. Such ideal physics has rarely been experimentally realized, however, because of the inevitable chemical disorder and Fermi-level pinning at typical metal-semiconductor interfaces(2,5-12). Here we report the creation of van der Waals metal-semiconductor junctions in which atomically flat metal thin films are laminated onto two-dimensional semiconductors without direct chemical bonding, creating an interface that is essentially free from chemical disorder and Fermi-level pinning. The Schottky barrier height, which approaches the Schottky-Mott limit, is dictated by the work function of the metal and is thus highly tunable. By transferring metal films (silver or platinum) with a work function that matches the conduction band or valence band edges of molybdenum sulfide, we achieve transistors with a two-terminal electron mobility at room temperature of 260 centimetres squared per volt per second and a hole mobility of 175 centimetres squared per volt per second. Furthermore, by using asymmetric contact pairs with different work functions, we demonstrate a silver/molybdenum sulfide/platinum photodiode with an open-circuit voltage of 1.02 volts. Our study not only experimentally validates the fundamental limit of ideal metal-semiconductor junctions but also defines a highly efficient and damage-free strategy for metal integration that could be used in high-performance electronics and optoelectronics.

E-mail:yhuang@seas.ucla.edu; xduan@chem.ucla.edu

25、被引频次: 193

题目: CHALLENGES FOR COMMERCIALIZING PEROVSKITE SOLAR CELLS

作者: RONG, YG;HU, Y;MEI, AY;TAN, HR;SAIDAMINOV, MI;SEOK, SI;MCGEHEE, MD;SARGENT, EH;HAN, HW

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地址: HUAZHONG UNIV SCI & TECHNOL, WUHAN NATL LAB OPTOELECT, MICHAEL GRATZEL CTR MESOSCOP SOLAR CELLS, WUHAN 430074, HUBEI, PEOPLES R CHINA;UNIV TORONTO, DEPT ELECT & COMP ENGN, 35 ST GEORGE ST, TORONTO, ON M5S 1A4, CANADA;NANJING UNIV, COLLABORAT INNOVAT CTR ADV MICROSTRUCT, JIANGSU KEY LAB ARTIFICIAL FUNCT MAT, NATL LAB SOLID STATE MICROSTRUCT,COLL ENGN & APPL, NANJING 210093, JIANGSU, PEOPLES R CHINA;ULSAN NATL INST SCI & TECHNOL, SCH NAT SCI, PEROVTRON RES CTR, 50 UNIST GIL, ULSAN 44919, SOUTH KOREA;ULSAN NATL INST SCI & TECHNOL, SCH ENERGY & CHEM ENGN, 50 UNIST GIL, ULSAN 44919, SOUTH KOREA;UNIV COLORADO, DEPT CHEM & BIOL ENGN, BOULDER, CO 80309 USA

摘要: Perovskite solar cells (PSCs) have witnessed rapidly rising power conversion efficiencies, together with advances in stability and upscaling. Despite these advances, their limited stability and need to prove upscaling remain crucial hurdles on the path to commercialization. We summarize recent advances toward commercially viable PSCs and discuss challenges that remain. We expound





the development of standardized protocols to distinguish intrinsic and extrinsic degradation factors in perovskites. We review accelerated aging tests in both cells and modules and discuss the prediction of lifetimes on the basis of degradation kinetics. Mature photovoltaic solutions, which have demonstrated excellent long-term stability in field applications, offer the perovskite community valuable insights into clearing the hurdles to commercialization.

E-mail: seoksi@unist.ac.kr; michael.mcgehee@colorado.edu; ted.sargent@utoronto.ca;  
hongwei.han@mail.hust.edu.cn

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## *ESI HIGHLY CITED PAPERS*

### *(Materials Science)*

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(来源: <http://esi.incites.thomsonreuters.com>)

1、被引频次: 7475

题目: SINGLE-LAYER MOS<sub>2</sub> TRANSISTORS

作者: RADISAVLJEVIC, B;RADENOVIC, A;BRIVIO, J;GIACOMETTI, V;KIS, A

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地址: ECOLE POLYTECH FED LAUSANNE, INST ELECT ENGN, CH-1015 LAUSANNE, SWITZERLAND;ECOLE POLYTECH FED LAUSANNE, INST BIOTECHNOL, CH-1015 LAUSANNE, SWITZERLAND

摘要: Two-dimensional materials are attractive for use in next-generation nanoelectronic devices because, compared to one-dimensional materials, it is relatively easy to fabricate complex structures from them. The most widely studied two-dimensional material is graphene(1,2), both because of its rich physics(3-5) and its high mobility(6). However, pristine graphene does not have a bandgap, a property that is essential for many applications, including transistors(7). Engineering a graphene bandgap increases fabrication complexity and either reduces mobilities to the level of strained silicon films(8-13) or requires high voltages(14,15). Although single layers of MoS<sub>2</sub> have a large intrinsic bandgap of 1.8 eV (ref. 16), previously reported mobilities in the 0.5-3 cm<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup> range(17) are too low for practical devices. Here, we use a hafnium oxide gate dielectric to demonstrate a room-temperature single-layer MoS<sub>2</sub> mobility of at least 200 cm<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup>, similar to that of graphene nanoribbons, and demonstrate transistors with room-temperature current on/off ratios of 1 x 10<sup>8</sup> and ultralow standby power dissipation. Because monolayer MoS<sub>2</sub> has a direct bandgap(16,18), it can be used to construct interband tunnel FETs<sup>19</sup>, which offer lower power consumption than classical transistors. Monolayer MoS<sub>2</sub> could also complement graphene in applications that require thin transparent semiconductors, such as optoelectronics and energy harvesting.

E-mail: [andras.kis@epfl.ch](mailto:andras.kis@epfl.ch); [chandras.kis@epfl.ch](mailto:chandras.kis@epfl.ch)

2、被引频次: 7275

题目: ELECTRONICS AND OPTOELECTRONICS OF TWO-DIMENSIONAL TRANSITION METAL DICHALCOGENIDES

作者: WANG, QH;KALANTAR-ZADEH, K;KIS, A;COLEMAN, JN;STRANO, MS

出处: NATURE NANOTECHNOLOGY 7 (11): 699-712 NOV 2012

地址: MIT, DEPT CHEM ENGN, CAMBRIDGE, MA 02139 USA;RMIT UNIV, SCH ELECT & COMP ENGN, MELBOURNE, VIC, AUSTRALIA;ECOLE POLYTECH FED LAUSANNE, INST ELECT ENGN, CH-1015 LAUSANNE, SWITZERLAND;TRINITY COLL DUBLIN, SCH PHYS, DUBLIN 2, IRELAND;TRINITY COLL DUBLIN, CRANN, DUBLIN 2, IRELAND

摘要: The remarkable properties of graphene have renewed interest in inorganic, two-dimensional

materials with unique electronic and optical attributes. Transition metal dichalcogenides (TMDCs) are layered materials with strong in-plane bonding and weak out-of-plane interactions enabling exfoliation into two-dimensional layers of single unit cell thickness. Although TMDCs have been studied for decades, recent advances in nanoscale materials characterization and device fabrication have opened up new opportunities for two-dimensional layers of thin TMDCs in nanoelectronics and optoelectronics. TMDCs such as MoS<sub>2</sub>, MoSe<sub>2</sub>, WS<sub>2</sub> and WSe<sub>2</sub> have sizable bandgaps that change from indirect to direct in single layers, allowing applications such as transistors, photodetectors and electroluminescent devices. We review the historical development of TMDCs, methods for preparing atomically thin layers, their electronic and optical properties, and prospects for future advances in electronics and optoelectronics.

E-mail: strano@mit.edu strano@mit.edu

### 3、被引频次: 5687

题目: IMPROVED SYNTHESIS OF GRAPHENE OXIDE

作者: MARCANO, DC;KOSYNKIN, DV;BERLIN, JM;SINITSKII, A;SUN, ZZ;SLESAREV, A;ALEMANY, LB;LU, W;TOUR, JM

出处: ACS NANO 4 (8): 4806-4814 AUG 2010

地址: RICE UNIV, DEPT CHEM, HOUSTON, TX 77005 USA;RICE UNIV, DEPT MECH ENGN & MAT SCI, HOUSTON, TX 77005 USA;RICE UNIV, SMALLEY INST NANOSCALE SCI & TECHNOL, HOUSTON, TX 77005 USA

摘要: An improved method for the preparation of graphene oxide (GO) is described. Currently, Hummers' method (KMnO<sub>4</sub>, NaNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>) is the most common method used for preparing graphene oxide. We have found that excluding the NaNO<sub>3</sub>, increasing the amount of KMnO<sub>4</sub>, and performing the reaction in a 9:1 mixture of H<sub>2</sub>SO<sub>4</sub>/H<sub>3</sub>PO<sub>4</sub> improves the efficiency of the oxidation process. This improved method provides a greater amount of hydrophilic oxidized graphene material as compared to Hummers' method or Hummers' method with additional KMnO<sub>4</sub>. Moreover, even though the GO produced by our method is more oxidized than that prepared by Hummers' method, when both are reduced in the same chamber with hydrazine, chemically converted graphene (CCG) produced from this new method is equivalent in its electrical conductivity. In contrast to Hummers' method, the new method does not generate toxic gas and the temperature is easily controlled. This improved synthesis of GO may be important for large-scale production of GO as well as the construction of devices composed of the subsequent CCG.

E-mail: tour@rice.edu tour@rice.edu

### 4、被引频次: 5384

题目: GRAPHENE AND GRAPHENE OXIDE: SYNTHESIS, PROPERTIES, AND APPLICATIONS

作者: ZHU, YW;MURALI, S;CAI, WW;LI, XS;SUK, JW;POTTS, JR;RUOFF, RS

出处: ADVANCED MATERIALS 22 (35): 3906-3924 SEP 15 2010

地址: UNIV TEXAS AUSTIN, DEPT MECH ENGN, AUSTIN, TX 78712 USA;UNIV TEXAS AUSTIN, TEXAS MAT INST, AUSTIN, TX 78712 USA

摘要: There is intense interest in graphene in fields such as physics, chemistry, and materials science, among others. Interest in graphene's exceptional physical properties, chemical tunability, and

potential for applications has generated thousands of publications and an accelerating pace of research, making review of such research timely. Here is an overview of the synthesis, properties, and applications of graphene and related materials (primarily, graphite oxide and its colloidal suspensions and materials made from them), from a materials science perspective.

E-mail: r.ruoff@mail.utexas.edur.ruoff@mail.utexas.edu

5、被引频次: 5050

题目: PLASMONICS FOR IMPROVED PHOTOVOLTAIC DEVICES

作者: ATWATER, HA;POLMAN, A

出处: NATURE MATERIALS 9 (3): 205-213 MAR 2010

地址: CALTECH, CTR SUSTAINABLE ENERGY RES, PASADENA, CA 91125 USA;CALTECH, THOMAS J WATSON LABS APPL PHYS, PASADENA, CA 91125 USA;FOM INST AMOLF, CTR NANOPHOTON, NL-1098 XG AMSTERDAM, NETHERLANDS

摘要: The emerging field of plasmonics has yielded methods for guiding and localizing light at the nanoscale, well below the scale of the wavelength of light in free space. Now plasmonics researchers are turning their attention to photovoltaics, where design approaches based on plasmonics can be used to improve absorption in photovoltaic devices, permitting a considerable reduction in the physical thickness of solar photovoltaic absorber layers, and yielding new options for solar-cell design. In this review, we survey recent advances at the intersection of plasmonics and photovoltaics and offer an outlook on the future of solar cells based on these principles.

E-mail: haa@caltech.edu; polman@amolf.nlhaa@caltech.edu; polman@amolf.nl

6、被引频次: 4959

题目: LI-O-2 AND LI-S BATTERIES WITH HIGH ENERGY STORAGE

作者: BRUCE, PG;FREUNBERGER, SA;HARDWICK, LJ;TARASCON, JM

出处: NATURE MATERIALS 11 (1): 19-29 JAN 2012

地址: UNIV ST ANDREWS, SCH CHEM, ST ANDREWS KY16 9ST, FIFE, SCOTLAND;CNRS, LAB REACTIVITE & CHIM SOLIDES, UMR 6007, F-80039 AMIENS, FRANCE

摘要: Li-ion batteries have transformed portable electronics and will play a key role in the electrification of transport. However, the highest energy storage possible for Li-ion batteries is insufficient for the long-term needs of society, for example, extended-range electric vehicles. To go beyond the horizon of Li-ion batteries is a formidable challenge; there are few options. Here we consider two: Li-air (O-2) and Li-S. The energy that can be stored in Li-air (based on aqueous or non-aqueous electrolytes) and Li-S cells is compared with Li-ion; the operation of the cells is discussed, as are the significant hurdles that will have to be overcome if such batteries are to succeed. Fundamental scientific advances in understanding the reactions occurring in the cells as well as new materials are key to overcoming these obstacles. The potential benefits of Li-air and Li-S justify the continued research effort that will be needed.

E-mail: pgb1@st-andrews.ac.ukpgb1@st-andrews.ac.uk

7、被引频次: 4941

题目: ROLL-TO-ROLL PRODUCTION OF 30-INCH GRAPHENE FILMS FOR TRANSPARENT ELECTRODES

作者: BAE, S;KIM, H;LEE, Y;XU, XF;PARK, JS;ZHENG, Y;BALAKRISHNAN, J;LEI, T;KIM, HR;SONG, YI;KIM, YJ;KIM, KS;OZYILMAZ, B;AHN, JH;HONG, BH;IIJIMA, S

出处: NATURE NANOTECHNOLOGY 5 (8): 574-578 AUG 2010

地址: SUNGKYUNKWAN UNIV, SKKU ADV INST NANOTECHNOL SAINT, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, CTR HUMAN INTERFACE NANO TECHNOL HINT, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, DEPT CHEM, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, SCH MECH ENGN, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, SCH ADV MAT SCI & ENGN, SUWON 440746, SOUTH KOREA;NATL UNIV SINGAPORE, NANOCORE & DEPT PHYS, SINGAPORE 117576, SINGAPORE;NATL UNIV SINGAPORE, NANOCORE & DEPT PHYS, SINGAPORE 117542, SINGAPORE;SAMSUNG TECHWIN, DIGITAL & IT SOLUT DIV, SONGNAM 462807, SOUTH KOREA;POHANG UNIV SCI & TECHNOL, DEPT CHEM, CTR SUPERFUNCT MAT, POHANG 790784, SOUTH KOREA;NATL INST ADV IND SCI & TECHNOL, NANOTUBE RES CTR, TSUKUBA, IBARAKI 3058565, JAPAN;MEIJO UNIV, FAC SCI & ENGN, NAGOYA, AICHI 4688502, JAPAN

摘要: The outstanding electrical(1), mechanical(2,3) and chemical(4,5) properties of graphene make it attractive for applications in flexible electronics(6-8). However, efforts to make transparent conducting films from graphene have been hampered by the lack of efficient methods for the synthesis, transfer and doping of graphene at the scale and quality required for applications. Here, we report the roll-to-roll production and wet-chemical doping of predominantly monolayer 30-inch graphene films grown by chemical vapour deposition onto flexible copper substrates. The films have sheet resistances as low as similar to 125 Omega square(-1) with 97.4% optical transmittance, and exhibit the half-integer quantum Hall effect, indicating their high quality. We further use layer-by-layer stacking to fabricate a doped four-layer film and measure its sheet resistance at values as low as similar to 30 Omega square(-1) at similar to 90% transparency, which is superior to commercial transparent electrodes such as indium tin oxides. Graphene electrodes were incorporated into a fully functional touch-screen panel device capable of withstanding high strain.

E-mail: ahnj@skku.edu; [byunghee@skku.edu](mailto:byunghee@skku.edu)

8、被引频次: 4931

题目: CHALLENGES FOR RECHARGEABLE LI BATTERIES

作者: GOODENOUGH, JB;KIM, Y

出处: CHEMISTRY OF MATERIALS 22 (3): 587-603 FEB 9 2010

地址: UNIV TEXAS AUSTIN, TEXAS MAT INST, AUSTIN, TX 78712 USA

摘要: The challenges for further development of Li rechargeable batteries for electric vehicles are reviewed. Most important is safety, which requires development of a nonflammable electrolyte with either a larger window between its lowest unoccupied molecular orbital (LUMO) and highest occupied molecular orbital (HOMO) or a constituent (or additive) that can develop rapidly a solid/electrolyte-interface (SEI) layer to prevent plating of Li on a carbon anode during a fast charge of the battery. A high Li(+)-ion conductivity ( $\sigma(\text{Li}) > 10^{-4}$  S/cm) in the electrolyte and across the electrode/ electrolyte interface is needed for a power battery. Important also is an increase in the density of the stored energy, which is the product of the voltage and capacity of reversible Li insertion/extraction into/from the electrodes. It will be difficult to design a better anode than carbon,

but carbon requires formation of an SEI layer, which involves an irreversible capacity loss. The design of a cathode composed of environmentally benign, low-cost materials that has its electrochemical potential well-matched to the HOMO of the electrolyte and allows access to two Li atoms per transition-metal cation would increase the energy density, but it is a daunting challenge. Two redox couples can be accessed where the cation redox couples are pinned at the top of the  $0\ 2p$  bands, but to take advantage of this possibility, it must be realized in a framework structure that can accept more than one Li atom per transition-metal cation. Moreover, such a situation represents an intrinsic voltage limit of the cathode, and matching this limit to the HOMO of the electrolyte requires the ability to tune the intrinsic voltage limit. Finally, the chemical compatibility in the battery must allow a long service life.

E-mail: [jgoodenough@mail.utexas.edu](mailto:jgoodenough@mail.utexas.edu)

9、被引频次: 4500

题目: EMERGING PHOTOLUMINESCENCE IN MONOLAYER  $\text{MoS}_2$

作者: SPLENDIANI, A;SUN, L;ZHANG, YB;LI, TS;KIM, J;CHIM, CY;GALLI, G;WANG, F

出处: NANO LETTERS 10 (4): 1271-1275 APR 2010

地址: UNIV CALIF BERKELEY, DEPT PHYS, BERKELEY, CA 94720 USA;SCUOLA GALILEIANA STUDI SUPER PADOVA, I-35122 PADOVA, ITALY;UNIV CALIF DAVIS, DEPT CHEM, DAVIS, CA 95616 USA;UNIV CALIF BERKELEY, LAWRENCE BERKELEY LAB, DIV MAT SCI, BERKELEY, CA 94720 USA

摘要: Novel physical phenomena can emerge in low-dimensional nanomaterials. Bulk  $\text{MoS}_2$ , a prototypical metal dichalcogenide, is an indirect bandgap semiconductor with negligible photoluminescence. When the  $\text{MoS}_2$  crystal is thinned to monolayer, however, a strong photoluminescence emerges, indicating an indirect to direct bandgap transition in this d-electron system. This observation shows that quantum confinement in layered d-electron materials like  $\text{MoS}_2$  provides new opportunities for engineering the electronic structure of matter at the nanoscale.

E-mail: [fengwang76@berkeley.edu](mailto:fengwang76@berkeley.edu)

10、被引频次: 4336

题目: LEAD IODIDE PEROVSKITE SENSITIZED ALL-SOLID-STATE SUBMICRON THIN FILM MESOSCOPIC SOLAR CELL WITH EFFICIENCY EXCEEDING 9%

作者: KIM, HS;LEE, CR;IM, JH;LEE, KB;MOEHL, T;MARCHIORO, A;MOON, SJ;HUMPHRY-BAKER, R;YUM, JH;MOSER, JE;GRATZEL, M;PARK, NG

出处: SCIENTIFIC REPORTS 2: - AUG 21 2012

地址: ECOLE POLYTECH FED LAUSANNE, LAB PHOTON & INTERFACES, INST CHEM SCI & ENGN, SCH BASIC SCI, CH-1015 LAUSANNE, SWITZERLAND;SUNGKYUNKWAN UNIV, SCH CHEM ENGN, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, DEPT ENERGY SCI, SUWON 440746, SOUTH KOREA

摘要: We report on solid-state mesoscopic heterojunction solar cells employing nanoparticles (NPs) of methyl ammonium lead iodide  $(\text{CH}_3\text{NH}_3)\text{PbI}_3$  as light harvesters. The perovskite NPs were produced by reaction of methylammonium iodide with  $\text{PbI}_2$  and deposited onto a submicron-thick mesoscopic  $\text{TiO}_2$  film, whose pores were infiltrated with the hole-conductor spiro-MeOTAD. Illumination with standard AM-1.5 sunlight generated large photocurrents ( $J(\text{SC})$ ) exceeding 17

mA/cm<sup>2</sup>), an open circuit photovoltage (V-OC) of 0.888 V and a fill factor (FF) of 0.62 yielding a power conversion efficiency (PCE) of 9.7%, the highest reported to date for such cells. Femto second laser studies combined with photo-induced absorption measurements showed charge separation to proceed via hole injection from the excited (CH<sub>3</sub>NH<sub>3</sub>)PbI<sub>3</sub> NPs into the spiro-MeOTAD followed by electron transfer to the mesoscopic TiO<sub>2</sub> film. The use of a solid hole conductor dramatically improved the device stability compared to (CH<sub>3</sub>NH<sub>3</sub>)PbI<sub>3</sub>-sensitized liquid junction cells.

E-mail: michael.graetzel@epfl.ch; [npark@skku.edu](mailto:npark@skku.edu)

11、被引频次: 3752

题目: TWO-DIMENSIONAL NANOSHEETS PRODUCED BY LIQUID EXFOLIATION OF LAYERED MATERIALS

作者: COLEMAN, JN;LOTYA, M;ONEILL, A;BERGIN, SD;KING, PJ;KHAN, U;YOUNG, K;GAUCHER, A;DE, S;SMITH, RJ;SHVETS, IV;ARORA, SK;STANTON, G;KIM, HY;LEE, K;KIM, GT;DUESBERG, GS;HALLAM, T;BOLAND, JJ;WANG, JJ;DONEGAN, JF;GRUNLAN, JC;MORIARTY, G;SHMELIOV, A;NICHOLLS, RJ;PERKINS, JM;GRIEVESON, EM;THEUWISSEN, K;MCCOMB, DW;NELLIST, PD;NICOLOSI, V

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地址: TRINITY COLL DUBLIN, SCH PHYS, DUBLIN D2, IRELAND;TRINITY COLL DUBLIN, CRANN, DUBLIN D2, IRELAND;TRINITY COLL DUBLIN, SCH CHEM, DUBLIN D2, IRELAND;KOREA UNIV, SCH ELECT ENGN, SEOUL, SOUTH KOREA;TEXAS A&M UNIV, DEPT MECH ENGN, COLLEGE STN, TX 77843 USA;UNIV OXFORD, DEPT MAT, OXFORD OX1 3PH, ENGLAND;UNIV LONDON IMPERIAL COLL SCI TECHNOL & MED, DEPT MAT, LONDON SW7 2AZ, ENGLAND

摘要: If they could be easily exfoliated, layered materials would become a diverse source of two-dimensional crystals whose properties would be useful in applications ranging from electronics to energy storage. We show that layered compounds such as MoS<sub>2</sub>, WS<sub>2</sub>, MoSe<sub>2</sub>, MoTe<sub>2</sub>, TaSe<sub>2</sub>, NbSe<sub>2</sub>, NiTe<sub>2</sub>, BN, and Bi<sub>2</sub>Te<sub>3</sub> can be efficiently dispersed in common solvents and can be deposited as individual flakes or formed into films. Electron microscopy strongly suggests that the material is exfoliated into individual layers. By blending this material with suspensions of other nanomaterials or polymer solutions, we can prepare hybrid dispersions or composites, which can be cast into films. We show that WS<sub>2</sub> and MoS<sub>2</sub> effectively reinforce polymers, whereas WS<sub>2</sub>/carbon nanotube hybrid films have high conductivity, leading to promising thermoelectric properties.

E-mail: colemaj@tcd.ie; [valeria.nicolosi@materials.ox.ac.uk](mailto:valeria.nicolosi@materials.ox.ac.uk)

12、被引频次: 3681

题目: BLACK PHOSPHORUS FIELD-EFFECT TRANSISTORS

作者: LI, LK;YU, YJ;YE, GJ;GE, QQ;OU, XD;WU, H;FENG, DL;CHEN, XH;ZHANG, YB

出处: NATURE NANOTECHNOLOGY 9 (5): 372-377 MAY 2014

地址: FUDAN UNIV, STATE KEY LAB SURFACE PHYS, SHANGHAI 200433, PEOPLES R CHINA;FUDAN UNIV, DEPT PHYS, SHANGHAI 200433, PEOPLES R CHINA;UNIV SCI & TECHNOL CHINA, HEFEI NATL LAB PHYS SCI MICROSCALE, HEFEI 230026, ANHUI, PEOPLES R CHINA;UNIV SCI & TECHNOL CHINA, DEPT PHYS, HEFEI 230026, ANHUI,

PEOPLES R CHINA

摘要: Two-dimensional crystals have emerged as a class of materials that may impact future electronic technologies. Experimentally identifying and characterizing new functional two-dimensional materials is challenging, but also potentially rewarding. Here, we fabricate field-effect transistors based on few-layer black phosphorus crystals with thickness down to a few nanometres. Reliable transistor performance is achieved at room temperature in samples thinner than 7.5 nm, with drain current modulation on the order of  $10^5$  and well-developed current saturation in the I-V characteristics. The charge-carrier mobility is found to be thickness-dependent, with the highest values up to similar to  $1,000 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  obtained for a thickness of similar to 10nm. Our results demonstrate the potential of black phosphorus thin crystals as a new two-dimensional material for applications in nanoelectronic devices.

E-mail: chenxh@ustc.edu.cn; [zhyb@fudan.edu.cn](mailto:zhyb@fudan.edu.cn)

13、被引频次: 3644

题目: LONG-RANGE BALANCED ELECTRON- AND HOLE-TRANSPORT LENGTHS IN ORGANIC-INORGANIC  $\text{CH}_3\text{NH}_3\text{PbI}_3$

作者: XING, GC;MATHEWS, N;SUN, SY;LIM, SS;LAM, YM;GRATZEL, M;MHAISALKAR, S;SUM, TC

出处: SCIENCE 342 (6156): 344-347 OCT 18 2013

地址: NANYANG TECHNOL UNIV, SCH PHYS & MATH SCI, DIV PHYS & APPL PHYS, SINGAPORE 637371, SINGAPORE;NANYANG TECHNOL UNIV, SCH MAT SCI & ENGN, SINGAPORE 639798, SINGAPORE;ENERGY RES INST NTU ERI N, SINGAPORE 637553, SINGAPORE;SINGAPORE BERKELEY RES INITIAT SUSTAINABLE ENERGY, SINGAPORE 138602, SINGAPORE;RHEIN WESTFAL TH AACHEN, INST MAT ELECT ENGN 2, D-52074 AACHEN, GERMANY;SWISS FED INST TECHNOL, DEPT CHEM & CHEM ENGN, LAB PHOTON & INTERFACES, STN 6, CH-1015 LAUSANNE, SWITZERLAND

摘要: Low-temperature solution-processed photovoltaics suffer from low efficiencies because of poor exciton or electron-hole diffusion lengths (typically about 10 nanometers). Recent reports of highly efficient  $\text{CH}_3\text{NH}_3\text{PbI}_3$ -based solar cells in a broad range of configurations raise a compelling case for understanding the fundamental photophysical mechanisms in these materials. By applying femtosecond transient optical spectroscopy to bilayers that interface this perovskite with either selective-electron or selective-hole extraction materials, we have uncovered concrete evidence of balanced long-range electron-hole diffusion lengths of at least 100 nanometers in solution-processed  $\text{CH}_3\text{NH}_3\text{PbI}_3$ . The high photoconversion efficiencies of these systems stem from the comparable optical absorption length and charge-carrier diffusion lengths, transcending the traditional constraints of solution-processed semiconductors.

E-mail: nripan@ntu.edu.sg; [tzechien@ntu.edu.sg](mailto:tzechien@ntu.edu.sg)

14、被引频次: 3566

题目:  $\text{CO}_3\text{O}_4$  NANOCRYSTALS ON GRAPHENE AS A SYNERGISTIC CATALYST FOR OXYGEN REDUCTION REACTION

作者: LIANG, YY;LI, YG;WANG, HL;ZHOU, JG;WANG, J;REGIER, T;DAI, HJ

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地址: STANFORD UNIV, DEPT CHEM, STANFORD, CA 94305 USA;CANADIAN LIGHT SOURCE INC, SASKATOON, SK S7N 0X4, CANADA

摘要: Catalysts for oxygen reduction and evolution reactions are at the heart of key renewable-energy technologies including fuel cells and water splitting. Despite tremendous efforts, developing oxygen electrode catalysts with high activity at low cost remains a great challenge. Here, we report a hybrid material consisting of Co<sub>3</sub>O<sub>4</sub> nanocrystals grown on reduced graphene oxide as a high-performance bi-functional catalyst for the oxygen reduction reaction (ORR) and oxygen evolution reaction (OER). Although Co<sub>3</sub>O<sub>4</sub> or graphene oxide alone has little catalytic activity, their hybrid exhibits an unexpected, surprisingly high ORR activity that is further enhanced by nitrogen doping of graphene. The Co<sub>3</sub>O<sub>4</sub>/N-doped graphene hybrid exhibits similar catalytic activity but superior stability to Pt in alkaline solutions. The same hybrid is also highly active for OER, making it a high-performance non-precious metal-based bi-catalyst for both ORR and OER. The unusual catalytic activity arises from synergetic chemical coupling effects between Co<sub>3</sub>O<sub>4</sub> and graphene.

E-mail: hdai@stanford.edu

15、被引频次: 3449

题目: BORON NITRIDE SUBSTRATES FOR HIGH-QUALITY GRAPHENE ELECTRONICS

作者: DEAN, CR;YOUNG, AF;MERIC, I;LEE, C;WANG, L;SORGENFREI, S;WATANABE, K;TANIGUCHI, T;KIM, P;SHEPARD, KL;HONE, J

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地址: COLUMBIA UNIV, DEPT ELECT ENGN, NEW YORK, NY 10027 USA;COLUMBIA UNIV, DEPT MECH ENGN, NEW YORK, NY 10027 USA;COLUMBIA UNIV, DEPT PHYS, NEW YORK, NY 10027 USA;SUNGKYUNKWAN UNIV, SKUU ADV INST NANOTECHNOL SAINT, SUWON 440746, SOUTH KOREA;SUNGKYUNKWAN UNIV, DEPT MECH ENGN, SUWON 440746, SOUTH KOREA;NATL INST MAT SCI, ADV MAT LAB, TSUKUBA, IBARAKI 3050044, JAPAN

摘要: Graphene devices on standard SiO<sub>2</sub> substrates are highly disordered, exhibiting characteristics that are far inferior to the expected intrinsic properties of graphene(1-12). Although suspending the graphene above the substrate leads to a substantial improvement in device quality(13,14), this geometry imposes severe limitations on device architecture and functionality. There is a growing need, therefore, to identify dielectrics that allow a substrate-supported geometry while retaining the quality achieved with a suspended sample. Hexagonal boron nitride (h-BN) is an appealing substrate, because it has an atomically smooth surface that is relatively free of dangling bonds and charge traps. It also has a lattice constant similar to that of graphite, and has large optical phonon modes and a large electrical bandgap. Here we report the fabrication and characterization of high-quality exfoliated mono- and bilayer graphene devices on single-crystal h-BN substrates, by using a mechanical transfer process. Graphene devices on h-BN substrates have mobilities and carrier inhomogeneities that are almost an order of magnitude better than devices on SiO<sub>2</sub>. These devices also show reduced roughness, intrinsic doping and chemical reactivity. The ability to assemble crystalline layered materials in a controlled way permits the fabrication of graphene devices on other promising dielectrics(15) and allows for the realization of more complex graphene heterostructures.

E-mail: cdean@cisl.columbia.edu; [jh2228@columbia.edu](mailto:jh2228@columbia.edu)

16、被引频次: 3400

题目: SOLVENT ENGINEERING FOR HIGH-PERFORMANCE INORGANIC-ORGANIC HYBRID PEROVSKITE SOLAR CELLS

作者: JEON, NJ;NOH, JH;KIM, YC;YANG, WS;RYU, S;SEOK, SI

出处: NATURE MATERIALS 13 (9): 897-903 SEP 2014

地址: KOREA RES INST CHEM TECHNOL, DIV ADV MAT, TAEJON 305600, SOUTH KOREA;SUNGKYUNKWAN UNIV, DEPT ENERGY SCI, SUWON 440746, SOUTH KOREA

摘要: Organolead trihalide perovskite materials have been successfully used as light absorbers in efficient photovoltaic cells. Two different cell structures, based on mesoscopic metal oxides and planar heterojunctions have already demonstrated very impressive advances in performance. Here, we report a bilayer architecture comprising the key features of mesoscopic and planar structures obtained by a fully solution-based process. We used  $\text{CH}_3\text{NH}_3\text{Pb}(\text{I}_{1-x}\text{Br}_x)_3$  ( $x = 0.1-0.15$ ) as the absorbing layer and poly(triarylamine) as a hole-transporting material. The use of a mixed solvent of gamma-butyrolactone and dimethylsulphoxide (DMSO) followed by toluene drop-casting leads to extremely uniform and dense perovskite layers via a  $\text{CH}_3\text{NH}_3\text{I}-\text{PbI}_2$ -DMSO intermediate phase, and enables the fabrication of remarkably improved solar cells with a certified power-conversion efficiency of 16.2% and no hysteresis. These results provide important progress towards the understanding of the role of solution-processing in the realization of low-cost and highly efficient perovskite solar cells.

E-mail: seoksi@kriect.re.kr

17、被引频次: 3308

题目: EMERGING APPLICATIONS OF STIMULI-RESPONSIVE POLYMER MATERIALS

作者: STUART, MAC;HUCK, WTS;GENZER, J;MULLER, M;OBER, C;STAMM, M;SUKHORUKOV, GB;SZLEIFER, I;TSUKRUK, VV;URBAN, M;WINNIK, F;ZAUSCHER, S;LUZINOV, I;MINKO, S

出处: NATURE MATERIALS 9 (2): 101-113 FEB 2010

地址: WAGENINGEN UNIV, LAB PHYS CHEM & COLLOID SCI, NL-6703 HB WAGENINGEN, NETHERLANDS;UNIV CAMBRIDGE, DEPT CHEM, MELVILLE LAB POLYMER SYNTH, CAMBRIDGE CB2 1EW, ENGLAND;N CAROLINA STATE UNIV, DEPT CHEM & BIOMOL ENGN, RALEIGH, NC 27695 USA;UNIV GOTTINGEN, INST THEORET PHYS, D-37077 GOTTINGEN, GERMANY;CORNELL UNIV, DEPT MAT SCI & ENGN, ITHACA, NY 14853 USA;LEIBNIZ INST POLYMERFORSCH DRESDEN EV, D-01069 DRESDEN, GERMANY;QUEEN MARY UNIV LONDON, SCH MAT SCI & ENGN, LONDON E1 4NS, ENGLAND;NORTHWESTERN UNIV, DEPT BIOMED ENGN, EVANSTON, IL USA;GEORGIA INST TECHNOL, SCH MAT SCI & ENGN, ATLANTA, GA 30332 USA;UNIV SO MISSISSIPPI, SCH POLYMERS & HIGH PERFORMANCE MAT, HATTIESBURG, MS 39406 USA;UNIV MONTREAL, DEPT CHEM, VILLE MONTREAL, PQ H3C 3J7, CANADA;UNIV MONTREAL, FAC PHARM, VILLE MONTREAL, PQ H3C 3J7, CANADA;DUKE UNIV, DEPT MECH ENGN & MAT SCI, DURHAM, NC 27708 USA;CLEMSON UNIV, SCH MAT SCI & ENGN, CLEMSON, SC 29634 USA;CLARKSON UNIV, DEPT CHEM & BIOMOL SCI, POTSDAM, NY 13699 USA

摘要: Responsive polymer materials can adapt to surrounding environments, regulate transport of ions and molecules, change wettability and adhesion of different species on external stimuli, or

convert chemical and biochemical signals into optical, electrical, thermal and mechanical signals, and vice versa. These materials are playing an increasingly important part in a diverse range of applications, such as drug delivery, diagnostics, tissue engineering and 'smart' optical systems, as well as biosensors, microelectromechanical systems, coatings and textiles. We review recent advances and challenges in the developments towards applications of stimuli-responsive polymeric materials that are self-assembled from nanostructured building blocks. We also provide a critical outline of emerging developments.

E-mail: luzinov@clemson.edu; sminko@clarkson.edu

18、被引频次: 3081

题目: GRAPHENE TRANSISTORS

作者: SCHWIERZ, F

出处: NATURE NANOTECHNOLOGY 5 (7): 487-496 JUL 2010

地址: TECH UNIV ILMENAU, D-98694 ILMENAU, GERMANY

摘要: Graphene has changed from being the exclusive domain of condensed-matter physicists to being explored by those in the electron-device community. In particular, graphene-based transistors have developed rapidly and are now considered an option for post-silicon electronics. However, many details about the potential performance of graphene transistors in real applications remain unclear. Here I review the properties of graphene that are relevant to electron devices, discuss the trade-offs among these properties and examine their effects on the performance of graphene transistors in both logic and radiofrequency applications. I conclude that the excellent mobility of graphene may not, as is often assumed, be its most compelling feature from a device perspective. Rather, it may be the possibility of making devices with channels that are extremely thin that will allow graphene field-effect transistors to be scaled to shorter channel lengths and higher speeds without encountering the adverse short-channel effects that restrict the performance of existing devices. Outstanding challenges for graphene transistors include opening a sizeable and well-defined bandgap in graphene, making large-area graphene transistors that operate in the current-saturation regime and fabricating graphene nanoribbons with well-defined widths and clean edges.

E-mail: [frank.schwierz@tu-ilmenau.de](mailto:frank.schwierz@tu-ilmenau.de)

19、被引频次: 3060

题目: FOR THE BRIGHT FUTURE-BULK HETEROJUNCTION POLYMER SOLAR CELLS WITH POWER CONVERSION EFFICIENCY OF 7.4%

作者: LIANG, YY;XU, Z;XIA, JB; TSAI, ST;WU, Y;LI, G;RAY, C;YU, LP

出处: ADVANCED MATERIALS 22 (20): E135-+ MAY 25 2010

地址: UNIV CHICAGO, DEPT CHEM, CHICAGO, IL 60637 USA;SOLARMER ENERGY INC, EL MONTE, CA 91731 USA

摘要: The photovoltaic performance of polymer bulk heterojunction solar cells is studied systematically. Using a new benzodithiophene polymer (PTB7) and PC71BM (see figure) a power conversion efficiency of 7.4% has been achieved in PTB7/PC71BM-blend film, indicating a great potential and bright future for polymer solar cells (FF = fill factor, PCE = power-conversion efficiency).

E-mail: [gangl@solarmer.com](mailto:gangl@solarmer.com); [lupingyu@uchicago.edu](mailto:lupingyu@uchicago.edu)

20、被引频次: 2896

题目: PHOSPHORENE: AN UNEXPLORED 2D SEMICONDUCTOR WITH A HIGH HOLE MOBILITY

作者: LIU, H;NEAL, AT;ZHU, Z;LUO, Z;XU, XF;TOMANEK, D;YE, PD

出处: ACS NANO 8 (4): 4033-4041 APR 2014

地址: PURDUE UNIV, SCH ELECT & COMP ENGN, W LAFAYETTE, IN 47907 USA;PURDUE UNIV, BIRCK NANOTECHNOL CTR, W LAFAYETTE, IN 47907 USA;MICHIGAN STATE UNIV, DEPT PHYS & ASTRON, E LANSING, MI 48824 USA;PURDUE UNIV, SCH MECH ENGN, W LAFAYETTE, IN 47907 USA

摘要: We introduce the 2D counterpart of layered black phosphorus, which we call phosphorene, as an unexplored p-type semiconducting material. Same as graphene and MoS<sub>2</sub>, single-layer phosphorene is flexible and can be mechanically exfoliated. We find phosphorene to be stable and, unlike graphene, to have an inherent, direct, and appreciable band gap. Our ab initio calculations indicate that the band gap is direct, depends on the number of layers and the in-layer strain, and is significantly larger than the bulk value of 0.31-036 eV. The observed photoluminescence peak of single-layer phosphorene in the visible optical range confirms that the band gap is larger than that of the bulk system. Our transport studies indicate a hole mobility that reflects the structural anisotropy of phosphorene and complements n-type MoS<sub>2</sub>. At room temperature, our few-layer phosphorene field-effect transistors with 1.0 μm channel length display a high on-current of 194 mA/mm, a high hole field-effect mobility of 286 cm<sup>2</sup>/V.s, and an on/off ratio of up to 10<sup>4</sup>. We demonstrate the possibility of phosphorene integration by constructing a 2D CMOS inverter consisting of phosphorene PMOS and MoS<sub>2</sub> NMOS transistors.

E-mail: [yep@purdue.edu](mailto:yep@purdue.edu)

21、被引频次: 2869

题目: ADVANCED MATERIALS FOR ENERGY STORAGE

作者: LIU, C;LI, F;MA, LP;CHENG, HM

出处: ADVANCED MATERIALS 22 (8): E28-+ FEB 23 2010

地址: CHINESE ACAD SCI, INST MET RES, SHENYANG NATL LAB MAT SCI, SHENYANG 110016, PEOPLES R CHINA

摘要: Popularization of portable electronics and electric vehicles worldwide stimulates the development of energy storage devices, such as batteries and supercapacitors, toward higher power density and energy density, which significantly depends upon the advancement of new materials used in these devices. Moreover, energy storage materials play a key role in efficient, clean, and versatile use of energy, and are crucial for the exploitation of renewable energy. Therefore, energy storage materials cover a wide range of materials and have been receiving intensive attention from research and development to industrialization. In this Review, firstly a general introduction is given to several typical energy storage systems, including thermal, mechanical, electromagnetic, hydrogen, and electrochemical energy storage. Then the current status of high-performance hydrogen storage materials for on-board applications and electrochemical energy storage materials for lithium-ion batteries and supercapacitors is introduced in detail. The strategies for developing these advanced energy storage materials, including nanostructuring nano-/microcombination, hybridization, pore-structure control, configuration design, surface modification, and composition optimization, are



discussed. Finally, the future trends and prospects in the development of advanced energy storage materials are highlighted.

E-mail: cheng@imr.ac.cn

22、被引频次: 2777

题目: THERMAL PROPERTIES OF GRAPHENE AND NANOSTRUCTURED CARBON MATERIALS

作者: BALANDIN, AA

出处: NATURE MATERIALS 10 (8): 569-581 AUG 2011

地址: UNIV CALIF RIVERSIDE, DEPT ELECT ENGN, BOURNS COLL ENGN, RIVERSIDE, CA 92521 USA; UNIV CALIF RIVERSIDE, MAT SCI & ENGN PROGRAM, BOURNS COLL ENGN, RIVERSIDE, CA 92521 USA

摘要: Recent years have seen a rapid growth of interest by the scientific and engineering communities in the thermal properties of materials. Heat removal has become a crucial issue for continuing progress in the electronic industry, and thermal conduction in low-dimensional structures has revealed truly intriguing features. Carbon allotropes and their derivatives occupy a unique place in terms of their ability to conduct heat. The room-temperature thermal conductivity of carbon materials span an extraordinary large range - of over five orders of magnitude - from the lowest in amorphous carbons to the highest in graphene and carbon nanotubes. Here, I review the thermal properties of carbon materials focusing on recent results for graphene, carbon nanotubes and nanostructured carbon materials with different degrees of disorder. Special attention is given to the unusual size dependence of heat conduction in two-dimensional crystals and, specifically, in graphene. I also describe the prospects of applications of graphene and carbon materials for thermal management of electronics.

E-mail: balandin@ee.ucr.edu

23、被引频次: 2773

题目: RAMAN SPECTROSCOPY AS A VERSATILE TOOL FOR STUDYING THE PROPERTIES OF GRAPHENE

作者: FERRARI, AC; BASKO, DM

出处: NATURE NANOTECHNOLOGY 8 (4): 235-246 APR 2013

地址: UNIV CAMBRIDGE, CAMBRIDGE GRAPHENE CTR, CAMBRIDGE CB3 0FA, ENGLAND; UNIV GRENOBLE 1, GRENOBLE, FRANCE; CNRS, LPMMC UMR 5493, GRENOBLE, FRANCE

摘要: Raman spectroscopy is an integral part of graphene research. It is used to determine the number and orientation of layers, the quality and types of edge, and the effects of perturbations, such as electric and magnetic fields, strain, doping, disorder and functional groups. This, in turn, provides insight into all sp<sup>2</sup>-bonded carbon allotropes, because graphene is their fundamental building block. Here we review the state of the art, future directions and open questions in Raman spectroscopy of graphene. We describe essential physical processes whose importance has only recently been recognized, such as the various types of resonance at play, and the role of quantum interference. We update all basic concepts and notations, and propose a terminology that is able to describe any result in literature. We finally highlight the potential of Raman spectroscopy for layered materials other

than graphene.

E-mail: acf26@eng.cam.ac.uk

24、被引频次: 2695

题目: NITROGEN-DOPED GRAPHENE AS EFFICIENT METAL-FREE ELECTROCATALYST FOR OXYGEN REDUCTION IN FUEL CELLS

作者: QU, LT;LIU, Y;BAEK, JB;DAI, LM

出处: ACS NANO 4 (3): 1321-1326 MAR 2010

地址: WENZHOU MED COLL, SCH OPHTHALMOL & OPTOMETRY, BIOMED ENGN ACAD, WENZHOU 325027, ZHEJIANG, PEOPLES R CHINA;BEIJING INST TECHNOL, SCH SCI, DEPT CHEM, BEIJING 100081, PEOPLES R CHINA;UNIST, SCH ENERGY ENGN, ULSAN 681800, SOUTH KOREA;CASE WESTERN RESERVE UNIV, DEPT CHEM ENGN, CLEVELAND, OH 44106 USA

摘要: Nitrogen-doped graphene (N-graphene) was synthesized by chemical vapor deposition of methane in the presence of ammonia. The resultant N-graphene was demonstrated to act as a metal-free electrode with a much better electrocatalytic activity, long-term operation stability, and tolerance to crossover effect than platinum for oxygen reduction via a four-electron pathway in alkaline fuel cells. To the best of our knowledge, this is the first report on the use of graphene and its derivatives as metal-free catalysts for oxygen reduction. The important role of N-doping to oxygen reduction reaction (ORR) can be applied to various carbon materials for the development of other metal-free efficient ORR catalysts for fuel cell applications, even new catalytic materials for applications beyond fuel cells.

E-mail: yongliu1980@hotmail.com; [liming.dai@case.edu](mailto:liming.dai@case.edu)

25、被引频次: 2629

题目: STIMULI-RESPONSIVE NANOCARRIERS FOR DRUG DELIVERY

作者: MURA, S;NICOLAS, J;COUVREUR, P

出处: NATURE MATERIALS 12 (11): 991-1003 NOV 2013

地址: UNIV PARIS 11, FAC PHARM, INST GALIEN PARIS SUD, UMR CNRS 8612, F-92296 CHATENAY MALABRY, FRANCE

摘要: Spurred by recent progress in materials chemistry and drug delivery, stimuli-responsive devices that deliver a drug in spatial-, temporal-and dosage-controlled fashions have become possible. Implementation of such devices requires the use of biocompatible materials that are susceptible to a specific physical incitement or that, in response to a specific stimulus, undergo a protonation, a hydrolytic cleavage or a (supra) molecular conformational change. In this Review, we discuss recent advances in the design of nanoscale stimuli-responsive systems that are able to control drug biodistribution in response to specific stimuli, either exogenous (variations in temperature, magnetic field, ultrasound intensity, light or electric pulses) or endogenous (changes in pH, enzyme concentration or redox gradients).

E-mail: [patrick.couvreur@u-psud.fr](mailto:patrick.couvreur@u-psud.fr)



## AIAA、IAF 最新会议

### AIAA

(AIAA 来源: <http://www.aiaa.org/>)

1.会议名称: 2020 Region VII Student Paper Competition & AIAA Sydney Section Student Conference

会议时间: 25 NOVEMBER - 26 NOVEMBER 2020

会议地点: Sydney, NSW (Australia)

会议简介: This year's Region VII Student Conference will be held on 25–26 November 2020 at the University of New South Wales (UNSW) in Sydney, NSW. The conference will be hosted by the UNSW AIAA Student Branch and the AIAA Sydney Section. The 2020 Region VII Student Conference provides students with ample opportunity to network with their peers and professional members of industry and present their original research in front of a group of volunteer professional member judges who will provide them with feedback. Students will have the chance to compete for cash prizes in a fun-filled two-day event!

New! Announcing a Master's Category – students pursuing a Master's by research degree across AIAA Region VII are welcome to submit their papers to the 2020 Region VII Student Conference.

链接:

<https://www.aiaa.org/events-learning/event/2020/11/25/default-calendar/2020-region-vii-student-paper-competition-aiaa-sydney-section-student-conference>

2.会议名称: 2021 AIAA Science and Technology Forum and Exposition (AIAA SciTech Forum)

会议时间: 11 JANUARY - 15 JANUARY 2021

会议地点: Nashville, Tennessee

会议简介: The AIAA SciTech Forum is the world's largest event for aerospace research, development, and technology. The 2021 forum scheduled for 11–15 January 2021 at Music City Center in Nashville, Tennessee will bring together experts to share ideas on Fluid Dynamics; Applied Aerodynamics; Guidance, Navigation, and Control; Structures; and much more.

链接:

[https://www.aiaa.org/events-learning/event/2021/01/11/default-calendar/2021-aiaa-science-and-technology-forum-and-exposition-\(aiaa-scitech-forum\)](https://www.aiaa.org/events-learning/event/2021/01/11/default-calendar/2021-aiaa-science-and-technology-forum-and-exposition-(aiaa-scitech-forum))

3.会议名称: 31st AAS/AIAA Space Flight Mechanics Meeting

会议时间: 31 JANUARY - 4 FEBRUARY 2021

会议地点: Charlotte, North Carolina

会议简介: The 31st AAS/AIAA Space Flight Mechanics Meeting hosted by the American Astronautical Society (AAS) and co-hosted by the American Institute of Aeronautics and Astronautics (AIAA), will be held 31 January–4 February 2021 in Charlotte, North Carolina. The

conference is organized by the AAS Space Flight Mechanics Committee and the AIAA Astrodynamics Technical Committee.

The call for papers for this conference is currently not available.

链接:

<https://www.aiaa.org/events-learning/event/2021/01/31/default-calendar/31st-aas-aiaa-space-flight-mechanics-meeting>

4.会议名称: 2021 IEEE Aerospace Conference

会议时间: 6 MARCH - 13 MARCH 2021

会议地点: Big Sky, Montana

会议简介: The international IEEE Aerospace Conference, with AIAA and PHM Society as technical cosponsors, is organized to promote interdisciplinary understanding of aerospace systems, their underlying science and technology, and their applications to government and commercial endeavors.

链接: <https://www.aiaa.org/events-learning/events>

5.会议名称: Congressional Visits Day 2021

会议时间: 16 MARCH 2021

会议地点: Washington, DC

会议简介: Congressional Visits Day (CVD) is an annual event that brings AIAA members—engineers, scientists, researchers, and students—to meet with national decision makers to discuss critical community issues in civil aeronautics, civil astronautics, and defense.

链接:

<https://www.aiaa.org/events-learning/event/2021/03/16/default-calendar/congressional-visits-day-2021>

1

## IAF

(IAF 来源: <http://www.iafastro.org/>)

1.会议名称: IAF Spring Meetings 2021

会议时间: 23 - 25 March 2021

会议地点: Paris, France

会议简介: As each year, the IAF is pleased to invite you to its Spring Meetings taking place in Paris, France where the IAF community will get together for three days, from 23 – 25 March 2021 in New CAP Conference Centre.

链接: <http://www.iafastro.org/events/iaf-spring-meetings/iaf-spring-meetings-2021/>





## ACM 最新会议

来源: <http://www.acm.org/>

### 1. 会议名称: ICBBB 2021

会议时间: January 9-12, 2021

会议地点: Tokyo, Japan

会议简介: Welcome to the official website of 2021 11th International Conference on Bioscience, Biochemistry and Bioinformatics (ICBBB 2021). ICBBB 2021 will be held in Tokai University, Tokyo, Japan during January 9-12, 2021. Previously, ICBBB 2020 in Kyoto, Japan, ICBBB 2019 in Singapore, ICBBB 2018 in Tokyo, Japan, ICBBB 2017 in Bangkok, Thailand, ICBBB 2016 in Pattaya, Thailand, ICBBB 2015 in Taipei, Taiwan, ICBBB 2014 in Melbourne, Australia, ICBBB 2013 in Rome, Italy, ICBBB 2012 in Chennai, India and ICBBB 2011 in Singapore had been successfully held.

ICBBB conference series held annually to provide an interactive forum for presentation and discussion on Bioscience, Biochemistry and Bioinformatics and related fields. The conference welcomes participants from all over the world who are interested in developing professional ties to and/or exploring career opportunities in the region. The conference should serve as an ideal forum to establish relationships from within Japan and other regions of the world.

链接: <http://www.icbbb.org/>

### 2.会议名称: DATE 2021

会议时间: Wed, 1 Jul 2021

会议地点: Grenoble, France

会议简介: Within the scope of the conference, the main areas of interest are organised in the following tracks. Submissions can be made to any of the track topics.

Track D: Design Methods and Tools, addresses design automation, design tools and hardware architectures for electronic and embedded systems. The emphasis is on methods, algorithms, and tools related to the use of computers in designing complete systems. The track's focus includes significant improvements on existing design methods and tools as well as forward-looking approaches to model and design future system architectures, design flows, and environments.

Track A: Application Design, is devoted to the presentation and discussion of design experiences with a high degree of industrial relevance, real-world implementations, and applications of specific design and test methodologies. Contributions should illustrate innovative or record-breaking designs, which will provide viable solutions in tomorrow's silicon, embedded systems, and large-scale systems. In topic A8, there is the opportunity to submit 2-page papers that expose industrial research and practice.

Track T: Test and Dependability, covers all test, design-for-test, reliability, and design-for-robustness issues, at system-, chip-, circuit-, and device-level for both analogue and digital electronics. Topics of interest also include diagnosis, failure mode analysis, debug and post-silicon validation challenges, and test or fault injection methods addressing system security.

Track E: Embedded and Cyber-Physical Systems, is devoted to the modelling, analysis, design and deployment of embedded software or embedded/cyber-physical systems. Areas of interest include methods, tools, methodologies and development environments. Emphasis will also be on model-based design and verification, embedded software platforms, software compilation and integration, real-time systems, cyber-physical systems, networked systems, and dependable systems.

链接: <https://www.date-conference.com/>

3.会议名称: ACM India Joint International Conference

会议时间: 2-4 January 2021

会议地点: IIIT Bangalore, India

会议简介: The ACM India Joint International Conference on Data Science and Management of Data (CODS-COMAD) 2021 (8th ACM IKDD CODS and 26th COMAD), will be held in Bangalore, India on January 2-4, 2021.

For over two decades, the International Conference on Management of Data (COMAD), modelled along the lines of ACM SIGMOD, has been the premier international database conference hosted in India by Division II of Computer Society of India. The first COMAD was held in 1989, and it has been held on a nearly annual basis since then (except for a few breaks such as in the years when VLDB and ICDE were held in India). CODS started in 2014 as a very successful conference with an excellent program and has been growing very strongly since then on the base growing interest in AI/Machine Learning/Data Science. These two conferences came together for the first time in 2018. This year again, we are bringing together the two related communities closer under a common umbrella.

链接: <https://cods-comad.in/>

4.会议名称: TEI 2021

会议时间: 14-17 Feb, 2021

会议地点: SALZBURG,AUSTRIA

会议简介: ACM TEI2021 is the 15th annual conference dedicated to presenting the latest results in tangible, embedded, and embodied interaction. The single-track conference will be held on February 14-17, 2021 in Salzburg, Austria.

The ACM International Conference on Tangible, Embedded and Embodied Interaction (TEI) addresses issues of human-computer interaction, novel tools and technologies, interactive art, and user experience. The work presented at TEI has a strong focus on how computing can bridge atoms and bits into cohesive interactive systems. The intimate size of this single-track conference provides a unique forum for exchanging ideas and presenting innovative work through talks and discussions, interactive exhibits such as demos and posters, hands-on studios, art installations and performances.

The theme for TEI2021 is The Art of Interaction, inviting all participants and in particular artists to speculate on a vision of how art impacts, inspires and shapes our research practice. We consider art and the artistic method an important aspect for tangible interaction design, ranging from physical to digital works across all genres, such as interactive installations, performance art, and tangible sculptures. TEI2021 will therefore focus on the further development of the art exhibition & performance track and foster the artistic method through a dedicated artist residency program in Linz and Salzburg.



In addition to the core research paper track, TEI2021 will continue the variety of additional submission and presentation formats from the previous years. This includes the new visual Pictorials publication format, as well as the opportunity to submit work-in-progress developments. Junior researchers will have the opportunity to present and discuss their work during the Graduate Student Consortium, which will take place along with a variety of hands-on Studies on Sunday before the main conference. Students are also welcome to participate in the Design Challenge, which offers a prize to the best material design ideas. TEI2021 will award the best research papers, and also distinct those with a focus on diversity and inclusion.

链接: <https://tei.acm.org/2021/>

5.会议名称: CC 2021

会议时间: Sat 27 February - Wed 3 March 2021

会议地点: Seoul, South Korea

会议简介: Welcome to the website of the International Conference on Compiler Construction 2021. The International Conference on Compiler Construction (CC) is interested in work on processing programs in the most general sense: analyzing, transforming or executing input that describes how a system operates, including traditional compiler construction as a special case.

CC is now an ACM SIGPLAN conference, and will implement guidelines and procedures recommended by SIGPLAN.

链接: <https://conf.researchr.org/home/CC-2021>

6.会议名称: ICIAI 2021

会议时间: March 5-8, 2021

会议地点: Xiamen, China

会议简介: 2021 the 5th International Conference on Innovation in Artificial Intelligence (ICIAI 2021) will be held in Xiamen, China during March 5-8, 2021. ICIAI 2021 will bring together an international community of experts to discuss the state-of-the-art for new research results, perspectives of future developments, and innovative applications relevant to Artificial Intelligence, mechatronics, robotics, control, and automation.

ICIAI2021 is sponsored by Research Institute of Big Data Analytics, Xi'an Jiaotong-Liverpool University, China. Assisted by The Hong Kong Polytechnic University, Hong Kong and University of Texas at Dallas, USA.

Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry.

链接: <http://ici.ai.org/>

7.会议名称: AfriCHI 2021

会议时间: March 8-12, 2021

会议地点: Maputo, Mozambique

会议简介: Our wish is to develop and sustain a unified forum and local expertise for Human-Computer Interaction (HCI) and Interaction Design (IXD) in Africa.



AfriCHI's mission is to be a pan-African conference that brings together researchers, academics, practitioners, industry professionals and students who are African, are based in Africa or undertake or collaborate on HCI and Interaction Design projects about Africa. The conference showcases contributions on practical, technical, methodological, empirical and theoretical aspects on all topics related to HCI and Interaction Design from as many African countries as possible.

链接: <https://africhi.org/>

8.会议名称: NISS 2021

会议时间: 01 - 02 April 2021

会议地点: Kenitra, Morocco

会议简介: The National School of Applied Science of Kenitra organizes the 4th edition of the International Conference on Networking, Information Systems & Security (NISS 2021).

NISS is a comprehensive conference focused on the various aspects of advances in Information systems, Security and Networking Technologies. The main purpose of NISS is to improve our research by achieving the highest capability and encourage open discussions on recent advances in computer communication and information technologies.

Authors are invited to submit original unpublished manuscripts that demonstrate recent advances in computer communications, wireless/mobile networks, information systems, intelligent systems and security in the theoretical and practical aspects.

Accepted papers will be published in the ACM ICPS series with an assigned ISBN: 978-1-4503-8871-9

All accepted papers will be available in ACM Digital Library and will be submitted for indexing on Scopus.

链接: <http://medi-ast.org/NISS2021/>

9.会议名称: The 36th ACM/SIGAPP Symposium On Applied Computing

会议时间: March 22-March 26, 2021

会议地点: Gwangju, Korea

链接: <http://www.sigapp.org/sac/sac2021/>



## ***IQPC 最新国防会议(Defence)***

IQPC 来源: <http://www.iqpc.com/>

1. 会议名称: Future Amphibious Forces

会议时间: 01 - 03 December, 2020

会议地点: Hilton London Kensington, London, United Kingdom

会议简介: Hosted with the official support of the Royal Marines, the inaugural Future Amphibious Force conference will bring together senior military and industry personnel to contribute and share knowledge on the future nature of amphibious operations, and the utility of amphibiousness. Our speakers will share their assessments of the changing threats faced by navies and amphibious forces (including A2/AD); priority capability areas for development, and how Marine forces are adapting to this new world through the use of new disruptive technologies.

The conference will take place at an exciting time for UK Amphibious capability, as the Royal Marines embark on a major transformation programme to develop the Future Commando Force.

FAF20 will feature keynote presentations from the Commandant General Royal Marines, as well as the heads of navies and marine corps from around the World, and we invite you to join us in discussing priority capability development areas, as well as new approaches and technologies for advancing amphibiousness.

链接:

[https://www.defenceiq.com/events-future-amphibious-force/?utm\\_medium=portal&utm\\_source=iqpc](https://www.defenceiq.com/events-future-amphibious-force/?utm_medium=portal&utm_source=iqpc)

2.会议名称: Air Integration Summit

会议时间: 01 January, 2021

会议地点: Hilton Canary Wharf, London

会议简介: Due to the ongoing situation with COVID-19, we have taken the decision to postpone the Air Integration Summit 2020.

The event is postponed until 2021, and we will update you again when the future dates are finalised. We apologise for any inconvenience caused however we will be back in 2021 to deliver a quality event and thank you for your support.

Previously the Close Air Support conference, Air Integration Summit 2021 will widen the scope of discussions and build meaningful consensus around solving shared challenges on integration of the Air domain within Joint combat operations. Within this single domain, multi-user context the re-formatted conference will discuss the most challenging issues at the 'business end' of air power and discuss the means by which attack capability can be delivered rapidly from the air in the most precise way.

Fresh light attack programmes, the growing focus on precise Joint effects and a NATO focus on greater interoperability for contested and multi-domain environments suggests an urgent need for development. As such we are pleased to host this summit to give leaders at the joint and coalition levels an opportunity to talk through their most critical challenges and share some insight into the

design of their attack mission set as well as participate in the discussions that will allow them to seize and exploit the initiative.

链接:

[https://www.defenceiq.com/events-airintegrationsummit/?utm\\_medium=portal&mac=IQPCCORP](https://www.defenceiq.com/events-airintegrationsummit/?utm_medium=portal&mac=IQPCCORP)

3.会议名称: International Armoured Vehicles

会议时间: 25 - 29 January, 2021

会议地点: Twickenham Stadium, London, United Kingdom

会议简介: The largest dedicated conference of its type, it annually brings together 650+ defence and industry leaders, with a military cohort comprising force and operational commanders, acquisition officials, requirement-setters, capability development experts and S&T architects.

For the first time in 2021, the conference will expand to span five days, with new dedicated sessions on amphibious vehicle capability and C4i that speak to critical priorities for the UK, US and its partners across NATO.

With representatives from over 40 nations currently confirmed - you can view the attendee list here IAVs has endured as the essential annual event for the armour community by consistently delivering world-class speakers from both the end-user community and industry partner communities, and by staying ahead of the curve with the technologies and concepts discussed over the four days.

链接:

[https://www.defenceiq.com/events-internationalarmouredvehicles/?utm\\_medium=portal&mac=IQPCORP](https://www.defenceiq.com/events-internationalarmouredvehicles/?utm_medium=portal&mac=IQPCORP)

4.会议名称: Maritime ISR Global

会议时间: 10 - 11 March, 2021

会议地点: London

会议简介: Maritime ISR Global 2020 will welcome 150 senior leaders from the UK, Australia, Sweden, Germany, NATO and many others to set a roadmap for delivering persistent maritime ISR. With Europe's defence narrative focused on the threat of peer conflict in the land environment, the Black Sea serves as a reminder that the ability to operate at sea is just as intrinsic to NATO's strategic priorities. As the uptick in non-NATO activity continues, its waters have become an important case study for delivering a global joint ISR capability – one that can overcome an increased operational tempo to sustain a high-level of decision support to the war fighter.

With the outcome of future combat operations dependent on integration – cross-platform and across domain – the first of the three days will ask how we can successfully embed the innovation that meets that need. The two main days will look at delivering integration in practice, and will ask how space, air, surface and sub-surface nodes can overcome the tyranny of scale to maximise MDA and improve data relay, delivering a multi-domain intelligence function which can incorporate cyber and mitigate the full-spectrum of hybrid threats to maintain information advantage.

For the first time in 2020, the conference includes a Focus Day on Anti-Submarine Warfare, recognising the revived importance of this mission set and the role of ASW assets in supporting a full-spectrum approach to MDA

链接: [https://www.defenceiq.com/events-maritimerecon/?utm\\_medium=portal&mac=IQPCCORP](https://www.defenceiq.com/events-maritimerecon/?utm_medium=portal&mac=IQPCCORP)

5.会议名称: Military Flight Training 2021

会议时间: 23 - 25 March, 2021

会议地点: Hilton Syon Park, London, United Kingdom

会议简介: Concurrent with today's operational context, Military Flight Training 2020 will discuss key challenge areas such as: training for contested and degraded environments, delivering LVC in mixed inventories of new and legacy platforms, solving red air deficiency, LVC interoperability, rotary-wing training, recruitment & retention, operational conversion training and crew resource management, integrated synthetic/virtual training capabilities, and effective threat emulations.

Attracting over 250 military and industry attendees from over 40 nations, Military Flight Training 2020 arrives at a time where guaranteeing air superiority and strike capability has never been tougher.

We very much hope that you will join the discussion in London, 7 - 9 December.

链接:

[https://www.defenceiq.com/events-militaryflighttraining/?utm\\_medium=portal&mac=IQPCCORP](https://www.defenceiq.com/events-militaryflighttraining/?utm_medium=portal&mac=IQPCCORP)

6.会议名称: Military Flight Training 2021

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编辑: 牛悦  
责任编辑: 路霞、施薇  
审稿: 李辉

承办: 图书馆信息咨询服务部  
E-mail: [sjxz@nwpu.edu.cn](mailto:sjxz@nwpu.edu.cn)  
电话: 029-88492928