Science Newsletter

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Introduction:

There are 3 main elements in the Science Newsletter is composed. In the first part, we provide articles about central issues for each discipline in this university, and they are provided with one subject for a time. In the second part, we select articles from the top journals in the whole science research. In the third part, we post information about calling papers for international conferences. Hopefully, some of the information in this manuscript may be useful for those who are dedicating to scientific career. Besides, the journals are also posted on the website of our library, and they are available to be accessed any time at http://lib.jsut.edu.cn/2018/1015/c5474a113860/page.htm. If there are any questions or suggestions, please send e-mails to 289595883@qq.com in no hesitate.

Ⅰ Topics

The key word of this month is **Electronics.** We list several articles which are related to the top concerned topics of computer science researches. The articles are classified in 5 categories, and they are: **Renewable energy technologies and systems, Energy efficiency, Solar energy materials, Wind energy technologies** and **Fuel cells**. Also, the listed articles are all arranged in a descending sort of impact factor in order to make it convenient to read. There are also links to both official site and full text for each article.

RENEWABLE ENERGY TECHNOLOGIES AND SYSTEMS

Energy Conversion and Management (impact factor: 10.41) 1 区

Off-grid hybrid photovoltaic – micro wind turbine renewable energy system with hydrogen and battery storage: Effects of sun tracking technologies

O.M. Babatunde · J.L. Munda · Y. Hamam

Abstract:

The residential application of renewable energy is on the rise in sub-Saharan Africa with many of these systems using battery storage systems as back-ups; however, the adoption of hydrogen storage systems in household energy system applications has attracted few research attentions. Since the environmental impact attributed to

hydrogen storage devices is small, it can serve as a complementary or alternative storage device. Using the hybrid optimisation model for electric renewables software, this study presents a techno-economic and sensitivity modelling of a solar photovoltaic (PV)/micro wind turbine/ fuel cell (FC) energy system backed up with both battery and hydrogen storage devices, under seven solar photovoltaic tracking orientations. Because of their strategic status in sub-Saharan Africa, one location each in South Africa and Nigeria were selected for the implementation of the study. The results show that the optimal energy system for the Nigerian scenario is a PV/FC/electrolyzer/battery/hydrogen storage system operated in the daily adjusted horizontal axis mode; the total net present cost and the cost of energy for this system is $9421 and $0.754/kWh respectively. As for the South African scenario, the optimal system is also a PV/FC/electrolyzer/battery/hydrogen storage system operated in the dual axis mode; its total net present cost and the cost of energy for the system is $8771 and $0.701/kWh respectively. Overall, the results show that the addition of a hydrogen storage system is technically feasible for most of the sun tracking configurations in both locations of study. Finally, the economic viability of hydrogen storage systems will be increased if the capital costs associated with the hydrogen sub-system is reduced.

Applied Energy (impact factor: 11.21) 1 ☒

Combined multi-objective optimization and agent-based modeling for a 100% renewable island energy system considering power-to-gas technology and extreme weather conditions

Li Li · Jing Wang · Xiaoyi Zhong et. al

Abstract:

Islands are constrained by geographical conditions in terms of energy delivery. Due to weak connections with the mainland and the power grid, the diversity of island energy demand leads to high economic costs and environmental pollution issues. This study proposes a 100% renewable island energy system, which integrates with power-to-gas, combined cooling, heating and power, and desalination technologies to supply electricity, heating, cooling, gas and fresh water to the local residents. A comprehensive approach for energy demand prediction, system design and dispatch optimization, as well as system evaluation is proposed. For energy demand prediction, agent-based modeling is used to simulate the demand of electricity, heating, cooling, gas and fresh water for the case study community on the island. The k-means clustering and scenario tree are further adopted to generate representative stochastic scenarios, which are applied to capture the uncertainty of energy demand. A multi-objective optimization model is developed to optimize the system design and scheduling strategy simultaneously. In order to demonstrate the effectiveness of the proposed approach and to evaluate the obtained optimal solutions for the case study, different objectives and extreme weather conditions are specifically considered. The optimal solution obtained shows that compared to battery storage, a 2.5% annual cost reduction can be achieved by using power-to-gas technology for energy storage. The findings also suggest that

extreme weather conditions can be coped with by increasing the capacity of biogas generation, desalination, and energy storage equipment, thereby improving the resilience of the island energy system.

Applied Energy (impact factor: 11.21) 1 ☒

Powering an island energy system by offshore floating technologies towards 100% renewables: A case for the Maldives

Dominik Keiner · Orlando Salcedo-Puerto · Ekaterina Immonen, et.al

Abstract:
Low-lying coastal areas and archipelago countries are particularly threatened by the impacts of climate change. Concurrently, many island states still rely on extensive use of imported fossil fuels, above all diesel for electricity generation, in addition to hydrocarbon-based fuels to supply aviation and marine transportation. Land area is usually scarce and conventional renewable energy solutions cannot be deployed in a sufficient way. This research highlights the possibility of floating offshore technologies being able to fulfil the task of replacing fossil fuels with renewable energy solutions in challenging topographical areas. On the case of the Maldives, floating offshore solar photovoltaics, wave power and offshore wind are modelled on a full hourly resolution in two different scenarios to deal with the need of transportation fuels: By importing the necessary, carbon neutral synthetic e-fuels from the world market, or by setting up local production capacities for e-fuels. Presented results show that a fully renewable energy system is technically feasible in 2030 with a relative cost per final energy of 120.3 €/MWh and 132.1 €/MWh, respectively, for the two scenarios in comparison to 105.7 €/MWh of the reference scenario in 2017. By 2050, cost per final energy can be reduced to 77.6 €/MWh and 92.6 €/MWh, respectively. It is concluded that floating solar photovoltaics and wave energy converters will play an important role in defossilisation of islands and countries with restricted land area.

Energy (impact factor: 9.01) 1 ☒

Comparative study for four technologies on flexibility improvement and renewable energy accommodation of combined heat and power system

Rujing Yan · Jiangjiang Wang · Shuojie Huo, et. Al

Abstract:
Insufficient flexibility of the combined heat and power (CHP) system brought by its inherent heat-electricity coupling limitation reduces its renewable energy consumption capacity. Accordingly, this paper integrates four technologies, including the electric boiler, heating energy storage, electrical energy storage and bypass compensation technology, into the CHP system for more flexibility. The flexibility improvement

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indicator and the operational model for the integrated CHP systems are developed from the feasible operation region perspectives. Besides, an operational optimization considering the punishment for renewable energy curtailment and load shedding is proposed to evaluate performance improvement quantitatively. Combined with the energy efficiency distribution within the feasible operation region, the operating performance promotion contributed by the technology integration is analyzed using a 350 MW CHP system. The results show that integrating the bypass compensation technology can increase the maximum heat-electricity ratio by 160.3% and the electricity adjustment capacity under the heating load of 375 MW by 90.95%in the same flexibility improvement rate. Besides, the electric boiler and bypass compassion technology effectively reduce total coal consumption due to their effectiveness in improving renewable energy consumption and the high energy efficiency distribution within the newly added feasible operation region. However, they hardly handle the load shedding. Inversely, the electrical and heating energy storage systems can address the load shedding but improve weakly renewable energy accommodation under a high renewable penetration rate.

Energy efficiency

Nature Energy (impact factor: 56.73) 1 ☒

A randomized trial of energy cost information provision alongside energy-efficiency classes for refrigerator purchases

Giovanna d'Adda · Yu Gao · Massimo Tavoni

Abstract:

Energy-efficiency classes provide coarse but easy-to-process information designed to help complex decisions. However, they are multi-attribute indices, imprecisely related to the running costs of graded products. Here we evaluate the impact of adding simple but accurate yearly or lifetime energy cost information to the European Union energy label. We conduct a field experiment with an online retailer of energy-using durables, measuring customers' (n = 126,614) search and purchases of refrigerators. Providing precise energy costs leads to purchasing products with lower prices and in lower energy-efficiency classes, but with similar overall energy and total costs. Furthermore, information provision lengthens product search among buyers, with more attention paid to low energy class products. These results highlight that the use of energy classes involves a trade-off between short-term economic savings and higher search cost. By drawing attention away from energy costs, energy-efficiency classes might not be adequate in the context of a fair and transparent climate transition.

Chemical Society Reviews (impact factor: 46.23) 1 ☒

Multicomponent reactions and photo/electrochemistry join forces: atom economy meets energy efficiency

Abstract:
Visible-light photoredox catalysis has been regarded as an extremely powerful tool in organic chemistry, bringing the spotlight back to radical processes. The versatility of photocatalyzed reactions has already been demonstrated to be effective in providing alternative routes for cross-coupling as well as multicomponent reactions. The photocatalyst allows the generation of high-energy intermediates through light irradiation rather than using highly reactive reagents or harsh reaction conditions. In a similar vein, organic electrochemistry has experienced a fruitful renaissance as a tool for generating reactive intermediates without the need for any catalyst. Such milder approaches pose the basis toward higher selectivity and broader applicability. In photocatalyzed and electrochemical multicomponent reactions, the generation of the radical species acts as a starter of the cascade of events. This allows for diverse reactivity and the use of reagents is usually not covered by classical methods. Owing to the availability of cheaper and more standardized photo- and electrochemical reactors, as well as easily scalable flow-setups, it is not surprising that these two fields have become areas of increased research interest. Keeping these in view, this review is aimed at providing an overview of the synthetic approaches in the design of MCRs involving photoredox catalysis and/or electrochemical activation as a crucial step with particular focus on the choice of the difunctionalized reagent.

Nature Nanotechnology (impact factor: 38.33) 1 ☒

Metal–organic frameworks and covalent organic frameworks as disruptive membrane materials for energy-efficient gas separation

A. Knebel · J. Caro

Abstract:
In this Review we survey the molecular sieving behaviour of metal–organic framework (MOF) and covalent organic framework (COF) membranes, which is different from that of classical zeolite membranes. The nature of MOFs as inorganic–organic hybrid materials and COFs as purely organic materials is powerful and disruptive for the field of gas separation membranes. The possibility of growing neat MOFs and COFs on membrane supports, while also allowing successful blending into polymer–filler composites, has a huge advantage over classical zeolite molecular sieves. MOFs and COFs allow synthetic access to more than 100,000 different structures and tailor-made molecular gates. Additionally, soft evacuation below 100 °C is often enough to achieve pore activation. Therefore, a huge number of synthetic methods for supported MOF and COF membrane thin films, such as solvothermal synthesis, seed-mediated growth and counterdiffusion, exist. Among them, methods with high scale-up potential, for example, layer-by-layer dip- and spray-coating, chemical and physical vapour deposition, and electrochemical methods. Additionally, physical methods have been developed that involve external

stimuli, such as electric fields and light. A particularly important point is their ability to react to stimuli, which has allowed the 'drawbacks' of the non-ideality of the molecular sieving properties to be exploited in a completely novel research direction. Controllable gas transport through membrane films is a next-level property of MOFs and COFs, leading towards adaptive process deviation. MOF and COF particles are highly compatible with polymers, which allows for mixed-matrix membranes. However, these membranes are not simple MOF–polymer blends, as they require improved polymer–filler interactions, such as cross-linking or surface functionalization.

Energy & Environmental Science (impact factor: 32.51) 1 ☒

Cascaded energy landscape as a key driver for slow yet efficient charge separation with small energy offset in organic solar cells

Shin-ichiro Natsuda · Toshiharu Saito · Rei Shirouchi, et. al

Abstract:
As demands for portable electronic devices grow, wireless energy transfer (WET) has started to become readily available. Until now, studies on WET have been mainly based on the electromagnetic (EM) induction method using EM waves. However, it is still challenging to utilize current EM wave mediated WET in those areas where it is most needed: underwater, body-implant, and EM-shielded cases (liquid/metals). Acoustic energy transfer (AET) can be an alternative to EM-wave based WET. Here, we present a simple but powerful triboelectric AET module by tuning the work function of the triboelectric layer via the large polarization of the embedded relaxor single crystal. Additionally, uniform displacement, a quasi-mode oscillation, across the flexible electrode surface in response to the square wave has improved energy transfer efficiency. A systematic investigation was conducted for energy transferring conditions of receiving angle and ferroelectric polarization. We successfully demonstrated the transmission of 8 mW electric power at a distance of 6 cm underwater, which is sufficient to use in most demanding but inaccessible areas. In addition, AET is demonstrated and discussed in both liquids (underwater and in-body), and solids (metal, wood, and plastic). We anticipate that our approach will enable current next-level AET technology to be utilized in the actual field.

SOLAR ENERGY MATERIALS

Chemical Reviews (impact factor: 62.12) 1 ☒

Semiconducting Polymers for Oxygen Evolution Reaction under Light Illumination

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Abstract:
Sunlight-driven water splitting to produce hydrogen fuel has stimulated intensive scientific interest, as this technology has the potential to revolutionize fossil fuel-based energy systems in modern society. The oxygen evolution reaction (OER) determines the performance of overall water splitting owing to its sluggish kinetics with multielectron transfer processing. Polymeric photocatalysts have recently been developed for the OER, and substantial progress has been realized in this emerging research field. In this Review, the focus is on the photocatalytic technologies and materials of polymeric photocatalysts for the OER. Two practical systems, namely, particle suspension systems and film-based photoelectrochemical systems, form two main sections. The concept is reviewed in terms of thermodynamics and kinetics, and polymeric photocatalysts are discussed based on three key characteristics, namely, light absorption, charge separation and transfer, and surface oxidation reactions. A satisfactory OER performance by polymeric photocatalysts will eventually offer a platform to achieve overall water splitting and other advanced applications in a cost-effective, sustainable, and renewable manner using solar energy.

Nature Reviews Materials (impact factor: 83.51) 1 ☒

Electronic defects in metal oxide photocatalysts

Ernest Pastor · Michael Sachs · Shababa Selim et.al

Abstract:
A deep understanding of defects is essential for the optimization of materials for solar energy conversion. This is particularly true for metal oxide photo(electro)catalysts, which typically feature high concentrations of charged point defects that are electronically active. In photovoltaic materials, except for selected dopants, defects are considered detrimental and should be eliminated to minimize charge recombination. However, photocatalysis is a more complex process in which defects can have an active role, such as in stabilizing charge separation and in mediating rate-limiting catalytic steps. In this Review, we examine the behaviour of electronic defects in metal oxides, paying special attention to the principles that underpin the formation and function of trapped charges in the form of polarons. We focus on how defects alter the electronic structure of metal oxides, statically or transiently upon illumination, and discuss the implications of such changes in light-driven catalytic reactions. Finally, we compare oxide defect chemistry with that of new photocatalysts based on carbon nitrides, polymers and metal halide perovskites.

Chemical Reviews (impact factor: 62.12) 1 ☒

Non-Noble Plasmonic Metal-Based Photocatalysts

Mahmoud Sayed · Jiaguo Yu · Gang Liu, et.al

Abstract:

Solar-to-chemical energy conversion via heterogeneous photocatalysis is one of the sustainable approaches to tackle the growing environmental and energy challenges. Among various promising photocatalytic materials, plasmonic-driven photocatalysts feature prominent solar-driven surface plasmon resonance (SPR). Non-noble plasmonic metals (NNPMs)-based photocatalysts have been identified as a unique alternative to noble metal-based ones due to their advantages like earth-abundance, cost-effectiveness, and large-scale application capability. This review comprehensively summarizes the most recent advances in the synthesis, characterization, and properties of NNPMs-based photocatalysts. After introducing the fundamental principles of SPR, the attributes and functionalities of NNPMs in governing surface/interfacial photocatalytic processes are presented. Next, the utilization of NNPMs-based photocatalytic materials for the removal of pollutants, water splitting, CO2 reduction, and organic transformations is discussed. The review concludes with current challenges and perspectives in advancing the NNPMs-based photocatalysts, which are timely and important to plasmon-based photocatalysis, a truly interdisciplinary field across materials science, chemistry, and physics.

Chemical Reviews (impact factor: 62.12) 1 区

Phase Change Materials for Renewable Energy Storage at Intermediate Temperatures

Karolina Matuszek · Mega Kar · Jennifer M, et.al

Abstract

Thermal energy storage technologies utilizing phase change materials (PCMs) that melt in the intermediate temperature range, between 100 and 220 °C, have the potential to mitigate the intermittency issues of wind and solar energy. This technology can take thermal or electrical energy from renewable sources and store it in the form of heat. This is of particular utility when the end use of the energy is also as heat. For this purpose, the material should have a phase change between 100 and 220 °C with a high latent heat of fusion. Although a range of PCMs are known for this temperature range, many of these materials are not practically viable for stability and safety reasons, a perspective not often clear in the primary literature. This review examines the recent development of thermal energy storage materials for application with renewables, the different material classes, their physicochemical properties, and the chemical structural origins of their advantageous thermal properties. Perspectives on further research directions needed to reach the goal of large scale, highly efficient, inexpensive, and reliable intermediate temperature thermal energy storage technologies are also presented.

Wind energy technologies

Chemical Reviews (impact factor: 62.12) 1 ☒

Rechargeable Batteries for Grid Scale Energy Storage

Zhengxin Zhu · Taoli Jiang · Mohsin Ali, et.al

Abstract

Ever-increasing global energy consumption has driven the development of renewable energy technologies to reduce greenhouse gas emissions and air pollution. Battery energy storage systems (BESS) with high electrochemical performance are critical for enabling renewable yet intermittent sources of energy such as solar and wind. In recent years, numerous new battery technologies have been achieved and showed great potential for grid scale energy storage (GSES) applications. However, their practical applications have been greatly impeded due to the gap between the breakthroughs achieved in research laboratories and the industrial applications. In addition, various complex applications call for different battery performances. Matching of diverse batteries to various applications is required to promote practical energy storage research achievement. This review provides in-depth discussion and comprehensive consideration in the battery research field for GSES. The overall requirements of battery technologies for practical applications with key parameters are systematically analyzed by generating standards and measures for GSES. We also discuss recent progress and existing challenges for some representative battery technologies with great promise for GSES, including metal-ion batteries, lead–acid batteries, molten-salt batteries, alkaline batteries, redox-flow batteries, metal–air batteries, and hydrogen-gas batteries. Moreover, we emphasize the importance of bringing emerging battery technologies from academia to industry. Our perspectives on the future development of batteries for GSES applications are provided.

Advanced Materials (impact factor: 29.42) 1 ☒

A Soft Magnetoelastic Generator for Wind Energy Harvesting

Xun Zhao · Ardo Nashalian · Il Woo Ock, et.al

Abstract

The current energy crises and imminent danger of global warming severely limit the ability to scale societal development sustainably. As such, there is a pressing need for utilizing renewable, green energy sources, such as wind energy, which is ubiquitously available on Earth. In this work, a fundamentally new wind-energy-harvesting technology is reported, which is based on the giant magnetoelastic effect in a soft composite system, namely, magnetoelastic generators. Its working principle is based on

wind-induced mechanical deformation, which alters the magnetic field in a soft system converting the wind energy into electricity via electromagnetic induction from arbitrary directions. The wind-energy-harvesting system features a low internal impedance of 68 Ω, a high current density of 1.17 mA cm–2, and a power density of 0.82 mW cm–2 under ambient natural wind. The system is capable of sustainably driving small electronics and electrolytically splitting water. The system can generate hydrogen at a rate of 7.5 × 10–2 mL h–1 with a wind speed of 20 m s−1. Additionally, since magnetic fields can penetrate water molecules, the magnetoelastic generators are intrinsically waterproof and work stably in harsh environments. This work paves a new way for wind-energy harvesting with compelling features, which can contribute largely to the hydrogen economy and the sustainability of human civilization.

Advanced Materials (impact factor: 29.42) 1 区

Environmental Self‐Adaptive Wind Energy Harvesting Technology for Self‐Powered System by Triboelectric‐Electromagnetic Hybridized Nanogenerator with Dual‐Channel Power Management Topology

Shun Yong · Hanqing Wang · Zenan Lin, et.al

Abstract

Natural wind energy harvesting enables a far-reaching and sustainable solution to supply pervasive sensors in the Internet of Things (IoT). Electromagnetic generators (EMGs) struggle to harvest energy from breezes, which causes regrettable energy wastage. Herein, a triboelectric-electromagnetic hybridized nanogenerator (TEHG) is designed with a dual-rotor structure to consolidate harvesting band for high efficiency of triboelectric nanogenerators (TENGs) in breeze and the EMG in high wind speeds. The TEHG performs an efficient energy collection (41.05 W m−3) and a smooth output in the wind speed of 2−16 m s−1, attributed to the environmental self-adaptive cooperation between TENGs and EMGs. The TENG output power contribution is more than 70% at low wind speeds (<5 m s−1). Moreover, a dual-channel power management topology (DcPMT) is established to co-manage outputs of two modules in TEHG. By virtue of the DcPMT hierarchically combining the isolated storage with undervoltagelockout strategy, the TEHG steadily supplies a standardized 3.3 V voltage for commercial electronics. Furthermore, a TEHG-based self-powered system is demonstrated for driving sensors to monitor meteorological information. The TEHG with DcPMT is advantageous in broad-band and high-efficiency of wind energy harvesting, thus exhibiting a great potential for elevating the environmental self-adaptability and stability margin of the IoT.

Energy Conversion and Management (impact factor: 10.41) 1 区

Off-grid hybrid photovoltaic – micro wind turbine renewable energy system with hydrogen and battery storage: Effects of sun tracking technologies

Abstract

The residential application of renewable energy is on the rise in sub-Saharan Africa with many of these systems using battery storage systems as back-ups; however, the adoption of hydrogen storage systems in household energy system applications has attracted few research attentions. Since the environmental impact attributed to hydrogen storage devices is small, it can serve as a complementary or alternative storage device. Using the hybrid optimisation model for electric renewables software, this study presents a techno-economic and sensitivity modelling of a solar photovoltaic (PV)/micro wind turbine/ fuel cell (FC) energy system backed up with both battery and hydrogen storage devices, under seven solar photovoltaic tracking orientations. Because of their strategic status in sub-Saharan Africa, one location each in South Africa and Nigeria were selected for the implementation of the study. The results show that the optimal energy system for the Nigerian scenario is a PV/FC/electrolyzer/battery/hydrogen storage system operated in the daily adjusted horizontal axis mode; the total net present cost and the cost of energy for this system is $9421 and $0.754/kWh respectively. As for the South African scenario, the optimal system is also a PV/FC/electrolyzer/battery/hydrogen storage system operated in the dual axis mode; its total net present cost and the cost of energy for the system is $8771 and $0.701/kWh respectively. Overall, the results show that the addition of a hydrogen storage system is technically feasible for most of the sun tracking configurations in both locations of study. Finally, the economic viability of hydrogen storage systems will be increased if the capital costs associated with the hydrogen sub-system is reduced.

Applied Energy (impact factor: 11.21) 1 ☒

Exploring the global and local social sustainability of wind energy technologies: An application of a social impact assessment framework

A. Buchmayr · E. Verhofstadt · L. Van Ootegem, et.al

Abstract

A transition to renewable energy sources is needed in the EU countries to achieve their goal of a low-carbon economy. This transition may come with potentially negative impacts on the well-being of the population, both globally and locally. Such social impacts are not yet systematically assessed for renewable energy technologies. In this paper, a social impact assessment framework for renewable energy technologies is developed and applied for a wind energy case study. The assessed social categories comprise impacts on human health, human rights infractions, working conditions, local job creation, quality of residential life, landscape quality. In order to cover this broad field of social impacts, four distinct social impact assessment methods were combined in a common social impact assessment framework. The application of the framework was demonstrated by means of the wind energy case study. The results are presented in the form of a social sustainability dashboard comprising 23 social impact indicators

covering both global and local well-being impacts. The analysis showed that the life cycle material demand of offshore wind projects has larger impacts on global well-being than the onshore alternatives. For the local dimension, the offshore case was found to be less intrusive for the local population.

FUEL CELLS

Chemical Reviews (impact factor: 62.12) 1 ☒

Electroceramics for High-Energy Density Capacitors: Current Status and Future Perspectives

Ge Wang · Zhilun Lu · Yong Li, et.al

Abstract

Materials exhibiting high energy/power density are currently needed to meet the growing demand of portable electronics, electric vehicles and large-scale energy storage devices. The highest energy densities are achieved for fuel cells, batteries, and supercapacitors, but conventional dielectric capacitors are receiving increased attention for pulsed power applications due to their high power density and their fast charge–discharge speed. The key to high energy density in dielectric capacitors is a large maximum but small remanent (zero in the case of linear dielectrics) polarization and a high electric breakdown strength. Polymer dielectric capacitors offer high power/energy density for applications at room temperature, but above 100 °C they are unreliable and suffer from dielectric breakdown. For high-temperature applications, therefore, dielectric ceramics are the only feasible alternative. Lead-based ceramics such as La-doped lead zirconate titanate exhibit good energy storage properties, but their toxicity raises concern over their use in consumer applications, where capacitors are exclusively lead free. Lead-free compositions with superior power density are thus required. In this paper, we introduce the fundamental principles of energy storage in dielectrics. We discuss key factors to improve energy storage properties such as the control of local structure, phase assemblage, dielectric layer thickness, microstructure, conductivity, and electrical homogeneity through the choice of base systems, dopants, and alloying additions, followed by a comprehensive review of the state-of-the-art. Finally, we comment on the future requirements for new materials in high power/energy density capacitor applications..

Nature (impact factor: 64.84) 1 ☒

Designing the next generation of proton-exchange membrane fuel cells

Kui Jiao · Jin Xuan · Qing Du, et.al

Abstract:
With the rapid growth and development of proton-exchange membrane fuel cell (PEMFC) technology, there has been increasing demand for clean and sustainable global energy applications. Of the many device-level and infrastructure challenges that need to be overcome before wide commercialization can be realized, one of the most critical ones is increasing the PEMFC power density, and ambitious goals have been proposed globally. For example, the short- and long-term power density goals of Japan's New Energy and Industrial Technology Development Organization are 6 kilowatts per litre by 2030 and 9 kilowatts per litre by 2040, respectively. To this end, here we propose technical development directions for next-generation high-power-density PEMFCs. We present the latest ideas for improvements in the membrane electrode assembly and its components with regard to water and thermal management and materials. These concepts are expected to be implemented in next-generation PEMFCs to achieve high power density.

Nature (impact factor: 64.84) 1 ☒

Restoring metabolism of myeloid cells reverses cognitive decline in ageing

Paras S. Minhas · Amira Latif-Hernandez · Melanie R. McReynolds，et.al

Abstract:
Ageing is characterized by the development of persistent pro-inflammatory responses that contribute to atherosclerosis, metabolic syndrome, cancer and frailty1,2,3. The ageing brain is also vulnerable to inflammation, as demonstrated by the high prevalence of age-associated cognitive decline and Alzheimer's disease4,5,6. Systemically, circulating pro-inflammatory factors can promote cognitive decline7,8, and in the brain, microglia lose the ability to clear misfolded proteins that are associated with neurodegeneration9,10. However, the underlying mechanisms that initiate and sustain maladaptive inflammation with ageing are not well defined. Here we show that in ageing mice myeloid cell bioenergetics are suppressed in response to increased signalling by the lipid messenger prostaglandin E2 (PGE2), a major modulator of inflammation11. In ageing macrophages and microglia, PGE2 signalling through its EP2 receptor promotes the sequestration of glucose into glycogen, reducing glucose flux and mitochondrial respiration. This energy-deficient state, which drives maladaptive pro-inflammatory responses, is further augmented by a dependence of aged myeloid cells on glucose as a principal fuel source. In aged mice, inhibition of myeloid EP2 signalling rejuvenates cellular bioenergetics, systemic and brain inflammatory states, hippocampal synaptic plasticity and spatial memory. Moreover, blockade of peripheral myeloid EP2 signalling is sufficient to restore cognition in aged mice. Our study suggests that cognitive ageing is not a static or irrevocable condition but can be reversed by reprogramming myeloid glucose metabolism to restore youthful immune functions.

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Science (impact factor: 56.91) 1 区

CO2 electrolysis to multicarbon products in strong acid

Jianan Erick Huang · Fengwang Li · Adnan Ozden, et.al

Abstract:

Carbon dioxide electroreduction (CO2R) is being actively studied as a promising route to convert carbon emissions to valuable chemicals and fuels. However, the fraction of input CO2 that is productively reduced has typically been very low, <2% for multicarbon products; the balance reacts with hydroxide to form carbonate in both alkaline and neutral reactors. Acidic electrolytes would overcome this limitation, but hydrogen evolution has hitherto dominated under those conditions. We report that concentrating potassium cations in the vicinity of electrochemically active sites accelerates CO2 activation to enable efficient CO2R in acid. We achieve CO2R on copper at pH <1 with a single-pass CO2 utilization of 77%, including a conversion efficiency of 50% toward multicarbon products (ethylene, ethanol, and 1-propanol) at a current density of 1.2 amperes per square centimeter and a full-cell voltage of 4.2 volts.

Nature (impact factor: 64.84) 1 区

Restoring metabolism of myeloid cells reverses cognitive decline in ageing

Xiao Zhang · Mengtao Zhang · Yuchen Deng，et.al

Abstract:

The water–gas shift (WGS) reaction is an industrially important source of pure hydrogen (H2) at the expense of carbon monoxide and water1,2. This reaction is of interest for fuel-cell applications, but requires WGS catalysts that are durable and highly active at low temperatures3. Here we demonstrate that the structure (Pt1–Ptn)/α-MoC, where isolated platinum atoms (Pt1) and subnanometre platinum clusters (Ptn) are stabilized on α-molybdenum carbide (α-MoC), catalyses the WGS reaction even at 313 kelvin, with a hydrogen-production pathway involving direct carbon monoxide dissociation identified. We find that it is critical to crowd the α-MoC surface with Pt1 and Ptn species, which prevents oxidation of the support that would cause catalyst deactivation, as seen with gold/α-MoC (ref. 4), and gives our system high stability and a high metal-normalized turnover number of 4,300,000 moles of hydrogen per mole of platinum. We anticipate that the strategy demonstrated here will be pivotal for the design of highly active and stable catalysts for effective activation of important molecules such as water and carbon monoxide for energy production.

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Ⅱ Concentration

PHYSICS

Thermodynamic evidence of fractional Chern insulator in moiré MoTe2

Yihang Zeng, Zhengchao Xia, Kaifei Kang, et al.

Abstract

Chern insulators, which are the lattice analogues of the quantum Hall states, can potentially manifest high-temperature topological orders at zero magnetic field to enable next-generation topological quantum devices1,2,3. Until now, integer Chern insulators have been experimentally demonstrated in several systems at zero magnetic field3,4,5,6,7,8, whereas fractional Chern insulators have been reported in only graphene-based systems under a finite magnetic field9,10. The emergence of semiconductor moiré materials11, which support tunable topological flat bands12,13, provides an opportunity to realize fractional Chern insulators13,14,15,16. Here we report thermodynamic evidence of both integer and fractional Chern insulators at zero magnetic field in small-angle twisted bilayer MoTe2 by combining the local electronic compressibility and magneto-optical measurements. At hole filling factor $\nu = 1$ and 2/3, the system is incompressible and spontaneously breaks time-reversal symmetry. We show that they are integer and fractional Chern insulators, respectively, from the dispersion of the state in the filling factor with an applied magnetic field. We further demonstrate electric-field-tuned topological phase transitions involving the Chern insulators. Our findings pave the way for the demonstration of quantized fractional Hall conductance and anyonic excitation and braiding17 in semiconductor moiré materials.

Universality in long-distance geometry and quantum complexity

Adam R. Brown, Michael H. Freedman, Henry W. Lin, et al.

Abstract

In physics, two systems that radically differ at short scales can exhibit strikingly similar macroscopic behaviour: they are part of the same long-distance universality class1. Here we apply this viewpoint to geometry and initiate a program of classifying homogeneous metrics on group manifolds2 by their long-distance properties. We show that many metrics on low-dimensional Lie groups have markedly different short-distance properties but nearly identical distance functions at long distances, and provide evidence that this phenomenon is even more robust in high dimensions. An application

of these ideas of particular interest to physics and computer science is complexity geometry3,4,5,6,7—the study of quantum computational complexity using Riemannian geometry. We argue for the existence of a large universality class of definitions of quantum complexity, each linearly related to the other, a much finer-grained equivalence than typically considered. We conjecture that a new effective metric emerges at larger complexities that describes a broad class of complexity geometries, insensitive to various choices of microscopic penalty factors. We discuss the implications for recent conjectures in quantum gravity.

Stringent test of QED with hydrogen-like tin

J. Morgner, B. Tu, C. M. König, T. Sailer, et al.

Abstract

Inner-shell electrons naturally sense the electric field close to the nucleus, which can reach extreme values beyond 1015 V cm−1 for the innermost electrons1. Especially in few-electron, highly charged ions, the interaction with the electromagnetic fields can be accurately calculated within quantum electrodynamics (QED), rendering these ions good candidates to test the validity of QED in strong fields. Consequently, their Lamb shifts were intensively studied in the past several decades2,3. Another approach is the measurement of gyromagnetic factors (g factors) in highly charged ions4,5,6,7. However, so far, either experimental accuracy or small field strength in low-Z ions5,6 limited the stringency of these QED tests. Here we report on our high-precision, high-field test of QED in hydrogen-like 118Sn49+. The highly charged ions were produced with the Heidelberg electron beam ion trap (EBIT)8 and injected into the ALPHATRAP Penning-trap setup9, in which the bound-electron g factor was measured with a precision of 0.5 parts per billion (ppb). For comparison, we present state-of-the-art theory calculations, which together test the underlying QED to about 0.012%, yielding a stringent test in the strong-field regime. With this measurement, we challenge the best tests by means of the Lamb shift and, with anticipated advances in the g-factor theory, surpass them by more than an order of magnitude.

MATERIALS

Cracking vs. surface reactivity in high-nickel cathodes for lithium-ion batteries

Steven Lee, Laisuo Su, Alex Mesnier, et al.

Abstract

High-nickel layered oxide cathodes LiNixMnyCozO2 (NMC) experience microcracks during cycling. This can expose fresh cathode surfaces for parasitic reactions and isolate

active cathode material from the conductive electrode matrix, resulting in impedance increase and capacity fade. The commonly held belief attributes microcracks to anisotropic lattice volume changes of primary particles during cycling. Nevertheless, recent reports suggest that certain electrolytes might reduce microcracks in NMC cathodes during deep cycling. This raises a crucial question on the origin of microcracks: do microcracks exacerbate surface stability, or does poor surface stability contribute to microcrack formation? This perspective aims to provide context and expound on this "chicken or egg" dilemma. We contend that the consequence of surface reactivity on the cycle life of high-Ni cathodes is more pronounced than that of particle cracking. We hypothesize that particle cracking is more of a symptom of severe surface reactivity rather than a cause of capacity fade. Graphical abstract Figure thumbnail fx1 Graphical Abstract View Large Image Figure Viewer Download Hi-res image

Molecular engineering of hole-selective layer for high band gap perovskites for highly efficient and stable perovskite-silicon tandem solar cells

Guoliang Wang, Jianghui Zheng, Weiyuan Duan, et al.

Abstract

In this work, a novel carbazole-based SAM (Ph-2PACz) was developed for facilitating efficient hole extraction and suppressing carrier recombination in high-band-gap (1.67 eV) perovskites for single-junction and tandem-cell demonstrations. The champion 21.3% efficient 1.67 eV cell produced a high fill factor (FF) of 82.6% and an open-circuit voltage (VOC) of 1.26 V, representing low band-gap-voltage offset at 0.41 V. When Ph-2PACz was applied to the top perovskite cell for a monolithic perovskite-Si tandem, a PCE of 28.9% (on 1 cm2) and a VOC of 1.91 V were obtained. When encapsulated, a tandem cell demonstrated excellent stability under continuous 1 sun illumination (680 h) and damp heat (280 h at 85°C + 85% relative humidity) and passed the International Electrotechnical Commission (IEC) 61215 thermal cycling (200 cycles between −40°C and 85°C) test, retaining 98.8% of the initial PCE.

Boosting the Reversibility and Kinetics of Anionic Redox Chemistry in Sodium-Ion Oxide Cathodes via Reductive Coupling Mechanism

Yao Wang, Xudong Zhao, Junteng Jin, et al.

Abstract

Activating anionic redox chemistry in layered oxide cathodes is a paradigmatic approach to devise high-energy sodium-ion batteries. Unfortunately, excessive oxygen redox usually induces irreversible lattice oxygen loss and cation migration, resulting in rapid capacity and voltage fading and sluggish reaction kinetics. Herein, the reductive coupling mechanism (RCM) of uncommon electron transfer from oxygen to copper

ions is unraveled in a novel P2-Na0.8Cu0.22Li0.08Mn0.67O2 cathode for boosting the reversibility and kinetics of anionic redox reactions. The resultant strong covalent Cu–(O–O) bonding can efficaciously suppress excessive oxygen oxidation and irreversible cation migration. Consequently, the P2-Na0.8Cu0.22Li0.08Mn0.67O2 cathode delivers a marvelous rate capability (134.1 and 63.2 mAh g–1 at 0.1C and 100C, respectively) and outstanding long-term cycling stability (82% capacity retention after 500 cycles at 10C). The intrinsic functioning mechanisms of RCM are fully understood through systematic in situ/ex situ characterizations and theoretical computations. This study opens a new avenue toward enhancing the stability and dynamics of oxygen redox chemistry.

CHEMISTRY

Ultralong durability of ethanol oxidation reaction via morphological design

Dongmeng Su, Zhenhui Lam, Yawen Wang, et al.

Abstract

A major challenge for the commercialization of direct alcohol fuel cells is the poor durability of the electrocatalysts. We demonstrate here that the morphological design of the catalyst could be an alternative solution. Sulfide-mediated Au@Pd nanowire arrays showed ultralong durability in chronoamperometric measurements, with 86% of the initial current retained after 1 h and an astonishing 38% retained after 56 h. The major discovery is that the turn-off voltage in the cyclic voltammetry could be delayed to as far as 5.2 V, suggesting delayed inhibition of the catalytic sites. The vertical arrays provide open diffusion channels with a concentration gradient so that the active sites would gradually move downward with the inhibition to form Pd-O-Pd. We postulate that the inhibition depends on the coupling between two Pd-OH groups, which is more probable at the Pd-Ox-rich regions of the top and less probable at the ethanol-rich regions at the bottom.

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Fluoride-Rich, Organic–Inorganic Gradient Interphase Enabled by Sacrificial Solvation Shells for Reversible Zinc Metal Batteries

Wangwang Xu, Jiantao Li, Xiaobin Liao, et al.

Abstract

Zinc metal batteries are strongly hindered by water corrosion, as solvated zinc ions would bring the active water molecules to the electrode/electrolyte interface constantly. Herein, we report a sacrificial solvation shell to repel active water molecules from the electrode/electrolyte interface and assist in forming a fluoride-rich, organic–inorganic gradient solid electrolyte interface (SEI) layer. The simultaneous sacrificial process of methanol and Zn(CF3SO3)2 results in the gradient SEI layer with an organic-rich surface (CH2OC– and C5 product) and an inorganic-rich (ZnF2) bottom, which combines the merits of fast ion diffusion and high flexibility. As a result, the methanol additive enables corrosion-free zinc stripping/plating on copper foils for 300 cycles with an average coulombic efficiency of 99.5%, a record high cumulative plating capacity of 10 A h/cm2 at 40 mA/cm2 in Zn/Zn symmetrical batteries. More importantly, at an ultralow N/P ratio of 2, the practical VO2//20 μm thick Zn plate full batteries with a high areal capacity of 4.7 mAh/cm2 stably operate for over 250 cycles, establishing their promising application for grid-scale energy storage devices. Furthermore, directly utilizing the 20 μm thick Zn for the commercial-level areal capacity (4.7 mAh/cm2) full zinc battery in our work would simplify the manufacturing process and boost the development of the commercial zinc battery for stationary storage.

BIOLOGY

Blood biomarker profiles and exceptional longevity: comparison of centenarians and non-centenarians in a 35-year follow-up of the Swedish AMORIS cohort

Shunsuke Murata, Marcus Ebeling, Anna C. Meyer, et al.

Abstract

Comparing biomarker profiles measured at similar ages, but earlier in life, among exceptionally long-lived individuals and their shorter-lived peers can improve our understanding of aging processes. This study aimed to (i) describe and compare biomarker profiles at similar ages between 64 and 99 among individuals eventually becoming centenarians and their shorter-lived peers, (ii) investigate the association between specific biomarker values and the chance of reaching age 100, and (iii) examine to what extent centenarians have homogenous biomarker profiles earlier in life. Participants in the population-based AMORIS cohort with information on blood-based biomarkers measured during 1985–1996 were followed in Swedish register data for up to 35 years. We examined biomarkers of metabolism, inflammation, liver, renal, anemia, and nutritional status using descriptive statistics, logistic regression, and cluster analysis. In total, 1224 participants (84.6% females) lived to their 100th birthday. Higher levels of total cholesterol and iron and lower levels of glucose, creatinine, uric acid, aspartate aminotransferase, gamma-glutamyl transferase, alkaline phosphatase, lactate dehydrogenase, and total iron-binding capacity were associated with reaching 100 years. Centenarians overall displayed rather homogenous biomarker profiles. Already from age 65 and onwards, centenarians displayed more favorable biomarker values in commonly available biomarkers than individuals dying before age 100. The differences in biomarker values between centenarians and non-centenarians more than one decade prior death suggest that genetic and/or possibly modifiable lifestyle factors reflected in these biomarker levels may play an important role for exceptional longevity.

Structure-destabilizing mutations unleash an intrinsic perforation activity of antiapoptotic Bcl-2 in the mitochondrial membrane enabling apoptotic cell death

Ping Gao, Zhi Zhang, Rui Wang, et al.

Abstract

Bcl-2 and Bax share a similar structural fold in solution, yet function oppositely in the mitochondrial outer membrane (MOM) during apoptosis. The proapoptotic Bax forms pores in the MOM to trigger cell death, whereas Bcl-2 inhibits the Bax pore formation to prevent cell death. Intriguingly both proteins can switch to a similar conformation after activation by BH3-only proteins, with multiple regions embedded in the MOM. Here we tested a hypothesis that destabilization of the Bcl-2 structure might convert

Bcl-2 to a Bax-like perforator. We discovered that mutations of glutamate 152 which eliminate hydrogen bonds in the protein core and thereby reduce the Bcl-2 structural stability. These Bcl-2 mutants induced apoptosis by releasing cytochrome c from the mitochondria in the cells that lack Bax and Bak, the other proapoptotic perforator. Using liposomal membranes made with typical mitochondrial lipids and reconstituted with purified proteins we revealed this perforation activity was intrinsic to Bcl-2 and could be unleashed by a BH3-only protein, similar to the perforation activity of Bax. Our study thus demonstrated a structural conversion of antiapoptotic Bcl-2 to a proapoptotic perforator through a simple molecular manipulation or interaction that is worthy to explore further for eradicating cancer cells that are resistant to a current Bcl-2-targeting drug.

Chlorogenic Acid Ameliorates Post-Infectious Irritable Bowel Syndrome by Regulating Extracellular Vesicles of Gut Microbes

Cihua Zheng, Yuchun Zhong, Wenming Zhang, et al.

Abstract

Post-infectious irritable bowel syndrome (PI-IBS) occurs after acute infectious diarrhea, and dysbiosis can be involved in its pathogenesis. Here, the role of chlorogenic acid (CGA) is investigated, a natural compound with several pharmacological properties, in alleviating PI-IBS in rats. It is elucidated that the gut microbiota plays a key role in PI-IBS pathogenesis and that rectal administration of CGA alleviated PI-IBS by modulating the gut microbiota and its metabolites. CGA supplementation significantly increased fecal Bacteroides acidifaciens abundance and glycine levels. Glycine structurally altered B. acidifaciens extracellular vesicles (EVs) and enriched functional proteins in the EVs; glycine-induced EVs alleviated PI-IBS by reducing inflammation and hypersensitivity of the intestinal viscera and maintaining mucosal barrier function. Moreover, B. acidifaciens EVs are enriched in the brain tissue. Thus, CGA mediates the mitigation of PI-IBS through the gut microbiota and its metabolites. This study proposes a novel mechanism of signal exchange between the gut microenvironment and the host.

Ⅲ Calling for papers

AEEES 2024

Submission deadline:	**Nov 5, 2023**
Conference date:	**Mar 28, 2024 - Mar 31, 2024**
Full name:	**IEEE 2024 The 6th Asia Energy and Electrical Engineering Symposium (IEEE AEEES 2024)**
Location:	**Chengdu, China**
Website:	http://www.aeees.org/cfp.html for more details

IEEE 2024 The 6th Asia Energy and Electrical Engineering Symposium, will take place in from . (http://aeees.org/)

⭐IEEE AEEES 2024 is sponsored by University of Electronic Science and Technology of China (UESTC), PES, IEEE, co-sponsored by Chengdu University of Technology (CDUT), Southwest University of Science and Technology (SWUST), China Electric Power Research Institute, Sichuan Society for Electrical Engineering, organized by School of Mechanical and Electrical Engineering, UESTC, technically supported by Aalborg University, Denmark, University of Calgary, Canada, The University of New South Wales, Australia, Wuhan University, China etc.

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* AEEES 2023 | IEEE Proceedings | ISBN: 978-1-6654-9053-5 | Online within 2 months | Successful EI Compendex and Scopus
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* AEEES 2021 | IEEE Proceedings | ISBN: 978-1-6654-2550-6 | Online within 3 month | Successful EI Compendex and Scopus
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2.Submit your paper through easychair system: http://www.easychair.org/conferences/?conf=aeees2024

Topics include, but not limited to:

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- Energy Conservation
- Energy Conversion
- Fuel Cell Technology
- Plasma Technology
- Renewable Energy Sources
- Solar Energy
- Water Energy
- Wind Energy
- POWER TRANSMISSION AND GENERATION
- Converters and Inverters
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- Grounding and Protection Systems
- HV Power Lines
- Network Harmonics
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- Power Distribution
- Power Flow Analysis
- Power Quality
- Power System Design
- Power System Operation
- Power System Planning
- Power System Stability and Control
- Reliability and Security
- Power system planning, Power management, Power engineering, and Education
- Breakdown Impacts

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ICMET 2024

Submission deadline: **Nov 10, 2023**

Conference date: **Apr 5, 2024 - Apr 7, 2024**

Full name: **2024 The 15th International Conference on Mechanical and Electrical Technologies (ICMET 2024)**

Location: **Kyoto, Japan**

Website: http://www.icmet.ac.cn

Topics:

1. Mechanical and Mechatronics Engineering and Technologies
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   - 1.2 Mechatronics and robotics
   - 1.3 Structural analysis
   - 1.4 Thermodynamics and thermo-science
   - 1.5 Design and drafting
   - 1.6 Biomechanics
   - 1.7 Micro- and Nano-Systems Engineering and Packaging
   - 1.8 Systems, Design, and Complexity
   - 1.9 Transportation Systems
   - 1.10 Vibration, Acoustics and Wave Propagation

2. Electrical Engineering
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   - 2.2 Energy Harvesting & Conversion
   - 2.3 Optics, Nanophotonics & Quantum Tech
   - 2.4 Nanotechnology & NEMS/MEMS
   - 2.5 Electronic Devices and Instrumentation
   - 2.6 Energy-Efficient Hardware Systems
   - 2.7 Control & Optimization
   - 2.8 Microelectronics
   - 2.9 Circuits and Systems
   - 2.10 Electrical Machines and Drive Systems
   - 2.11 Electric Vehicle Technologies
   - 2.12 High Voltage and Insulation Technologies
   - 2.13 Drive Systems
   - 2.14 Power Quality and Electromagnetic Compatibility
   - 2.15 Power System Reliability and Security

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IEEE ICoPESA 2024

Submission deadline: **Nov 10, 2023**
Conference date: **Mar 1, 2024 - Mar 3, 2024**
Full name: **IEEE--2024 8th International Conference on Power Energy Systems and Applications (ICoPESA 2024)**
Location: **HongKong**
Website: http://www.icpesa.org/

2024 8th International Conference on Power Energy Systems and Applications (ICoPESA 2024) will be held at Hong Kong during March 1-3, 2024. ICoPESA 2024 continues to retain its tradition of high-quality conference and will open up an opportunity for academics and industrial professionals worldwide to exchange their knowledge of the state-of-the-art power energy systems and applications, the future role of power energy systems in ecological revolution will be explored at ICoPESA.

*Proceedings
Accepted full papers after successful registration and proper presentation will be included in ICoPESA Conference Proceedings, submitted to Ei Compendex, Scopus, etc.
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- Power Electronics Security
- Smart Technologies and Smart Solutions in Future Electrical Power Systems
- ICT and Cyber Security for Electrical Power Systems

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ACEE 2024

Submission deadline:	**Nov 20, 2023**
Conference date:	**Apr 19, 2024 - Apr 21, 2024**
Full name:	**2024 2nd Asia Conference on Electronics Engineering (ACEE 2024)**
Location:	**Singapore**
Website:	http://www.acee.net/

Nowadays, we are surrounded by electronic devices in our everyday lives, such as, phones, computer, etc. The electronic devices have become an indispensable part of our lives. At the situation, 2024 2nd Asia Conference on Electronics Engineering (ACEE 2024) will be held in Singapore during April 19-21, 2024. It aims to bring together researchers in the related areas, which devoted their work to push the development of electronics engineering.

The conference topics include several tracks, such as, Electronics, Control and Computer Systems, Telecommunication Engineering, Computer Engineering, etc. ACEE 2024 conference seeks papers presenting significant and novel research results on emerging electronics engineering and its applications. We especially encourage submissions that present novel experimentation, creative use of electronic technologies, and new insights made possible using analysis. We invite submissions on a wide range of electronics engineering's topics. Welcome you to submit the paper or abstract!

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* Electronic Materials
* Radio Frequency Integrated Circuit Design (RFIC)
* Analog Integrated Circuit Design

Track 2. Control and Computer Systems:
* Optimal, Robust and Adaptive Controls
* Non Linear and Stochastic Controls
* Modeling and Identification
* Image Based Control

Track 3. Telecommunication Engineering:
* Antenna and Wave Propagation
* Modulation and Signal Processing for Telecommunication
* Wireless and Mobile Communications
* Information Theory and Coding

Track 4. Computer Engineering:
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* Parallel and Distributed Computer
* Pervasive Computing
* Computer Network
* Embedded System

Track 5. Imaging and Sensor Engineering:
* Medical Imaging
* Magnetic Resonance Imaging (MRI)
* Cancer Detection and Imaging of Margins
* Real-time Imaging and Video Processing

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