Science Newsletter

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Contents

Editor: Yue Wei（魏悦） TEL: 3548 Email: 289595883@qq.com

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 **Fluid Flow and Transfer Processes.** 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: **Fluid Flow and Transfer Processes, Mechanical Engineering, Condensed Matter Physics, General Physics and Astronomy** and **General Chemical Engineering**. 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.

FLUID FLOW AND TRANSFER PROCESSES

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Fundamental and estimation of thermal contact resistance between polymer matrix composites: A review

Tian Zhou, Yejing Zhao, Zhenghua Rao

Abstract:

The thermal contact resistance (TCR) between polymer matrix composites (PMCs) imposes the significant impacts on the design, processing and application of these materials. This paper reviews the fundamental of the interfacial thermal conductance mechanism by analyzing the effects of inherent material properties, surface topography

and working conditions of PMCs on TCR. Experimental measurement and numerical modeling methods are addressed to identify the distinct characteristics for estimating the TCR between PMCs. The main challenges for the accurate estimation are summarized, mainly including the complex interfacial thermal conductance due to the addition of fillers, the anisotropic thermal and mechanical responses due to the heterogeneity of PMCs, the uncertain contact mechanics due to the special mechanical properties. Finally, the multiscale estimation and machine learning methods are proposed for the further study on TCR between PMCs. This review is important because it provides guidance for the future studies in the interfacial thermal conductance between PMCs and thus the wide applications of emerging composites.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Canopy-to-canopy liquid cooling for the thermal management of lithium-ion batteries, a constructal approach

Sahin Gungor · Erdal Cetkin · Sylvie Lorente

Abstract:
With the growing interest on electric vehicles comes the question of the thermal management of their battery pack. In this work, we propose a thermally efficient solution consisting in inserting between the cells a liquid cooling system based on constructal canopy-to-canopy architectures. In such systems, the cooling fluid is driven from a trunk channel to perpendicular branches that make the tree canopy. An opposite tree collects the liquid in such a way that the two trees match canopy-to-canopy.
The configuration of the cooling solution is predicted following the constructal methodology, leading to the choice of the hydraulic diameter ratios. We show that such configurations allow extracting most of the non-uniformly generated heat by the battery cell during the discharging phase, while using a small mass flow rate.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Structure optimization of a heat pipe-cooling battery thermal management system based on fuzzy grey relational analysis

Linfeng He · Xianwen Tang · Qiliang Luo, et. al

Abstract:
An efficient thermal management system is essential to maintain its good performance of a power battery pack. Evaluating the impacts of influential factors on the system cooling performance helps guide the design of the battery thermal management system. In the present work, a battery thermal management system based on heat pipes combined with a liquid-cooling plate is proposed. Orthogonal design and fuzzy grey relational analysis are employed as evaluating methods, and numerical simulations are carried out to investigate the influence of four structure parameters of

the aluminum sheet (the height, the thickness, the covering angle to battery, and the covering angle to heat pipe) on the temperature distribution of the battery pack. Results show that, in order to keep a good operating temperature range of the battery, the values of the height, the thickness, the covering angle to battery and the covering angle to heat pipe of the aluminum sheet are suggested to be above 50 mm, 2 mm, 75° and 60°, respectively. The covering angle of aluminum sheet to battery has the most influential impact on the system cooling performance, and the covering angle to heat pipe has the slightest influence. The optimal value of the maximum temperature is 37.58 °C and the temperature difference is 3.67 °C.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 ☒

Thermal transport in planar sp2-hybridized carbon allotropes: A comparative study of biphenylene network, pentaheptite and graphene

Penghua Ying · Ting Liang · Yao Du, et. Al

Abstract:
The biphenylene network with periodically arranged four-, six-, and eight-membered rings has been successfully synthesized in very recent experiments. This novel two-dimensional (2D) carbon allotrope has potentials in applications of lithium storage and carbon-based circuitry. Understanding the thermal transport properties of biphenylene network is of critical importance for the performance and reliability of its practical applications. To this end, the thermal transport in biphenylene network is comprehensively investigated in this paper with the aid of molecular dynamics simulations together with first-principles calculations. For the sake of comparison, the thermal conductivities of other 2D sp2-hybridized carbon allotropes including graphene and pentaheptite are also investigated using the same method. It is found that the thermal conductivities of biphenylene network and pentaheptite are, respectively, only about one-thirteenth and one-eighth of graphene. Through the analysis of phonon property, mechanical property and electron density distribution, it is demonstrated that the great reduction in the thermal conductivity of biphenylene network and pentaheptite arises from the decline in their structural symmetry, which leads to the decrease of phonon group velocity and the reduction of phonon mean free path.

Mechanical Engineering

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 ☒

Topology optimization design and numerical analysis on cold plates for lithium-ion battery thermal management

Fan Chen · Jiao Wang · Xinglin Yang

Abstract:
In this paper, the cold plates are designed to cool the rectangular lithium-ion battery

packs by the topology optimization method. The topology optimization method obtains the channel structure in the two-dimensional model, and three-dimensional cold plate models are then established according to their two-dimensional structure. In a simple model for a battery pack, numerical analyses of topology optimization cold plate (TCP) are implemented using COMSOL software. Numerical results were compared with conventional rectangular-channel cold plate (RCP) and serpentine-channel cold plate (SCP) to investigate the cooling performance and flow characteristics of the cold plate. The results demonstrate that the flow channel structure of the cold plate has a significant influence on the temperature distribution of the battery. At 150 Pa inlet pressure, the maximum temperature of batteries with TCPs is reduced by 0.27% and 1.08% compared to that with RCP or SCP, and the temperature difference is lowered by 19.50% and 41.88%. Appropriately increasing the inlet pressure of the cold plate can also reduce the maximum temperature and temperature difference of batteries. Due to low flow resistance and high heat transfer coefficient, topology optimization will be widely used to design battery cold plates.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 ☒

Forced convective and sub-cooled flow boiling heat transfer in a hypervapotron heat sink under one-side heating condition

Ji Hwan Lim · Minkyu Park

Abstract:

Several studies have been conducted on hypervapotron (HV) cooling channels for the application of the fusion tokamak cooling system; however, most of them have focused on the critical heat flux (CHF). To predict the thermal efficiency of the tokamak system of a DEMO or commercial plant, it is necessary to predict the heat transfer performance of the HV. Therefore, in this study, the heat transfer characteristics of a one-side heated hypervapotron cooling channel under subcooled flow conditions were analysed. The subcooled flow boiling experiment was conducted as a method of gradually increasing the applied heat, and the heat transfer performance in all flow regimes from the single-phase regime to the CHF was measured. In subcooled flow boiling, it was found that three flow regimes exist: the single-phase (SP), partially developed nucleate boiling (PDB), and fully developed nucleate boiling (FDB) regimes. Additionally, we analysed different heat transfer mechanisms for each flow regime. The effects of system parameters such as the system pressure, sub-cooling, and mass flow rate on heat transfer were analysed, and the prediction performance of existing heat transfer correlations developed for application to the three flow regimes was evaluated. However, it was difficult to find a correlation reflecting the heat transfer performance enhanced by the fin structure of the HV, and the authors of this study developed heat transfer correlations using Python code and an artificial intelligence regression method

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 ☒

Boiling crisis due to bubble interactions

Lenan Zhang · Shuai Gong · Zhengmao Lu, et. al

Abstract:
The boiling crisis determines the maximum heat flux for the safe operation of boiling equipment, which is widely used in various applications including power generation, thermal management of electronics and water desalination. Here we present a mechanistic and predictive theory for the boiling crisis, combining the thermo-fluidic interaction between bubbles and the stochastic interaction of nucleation sites. Using Rayleigh and Poisson distributions, we demonstrate that the boiling crisis occurs when the population of isolated nucleation sites reaches the maximum. We identified a dimensionless boiling crisis constant $1/\pi e$, which universally relates the bubble base diameter to the isolated nucleate site density during the saturated pool boiling crisis. This finding is supported by our direct numerical simulation as well as by previous numerical and experimental results. Combining the thermo-fluidic and stochastic interaction, quantitative and simultaneous predictions of the critical heat flux (CHF) and the corresponding wall superheat at the CHF were achieved, which agrees with existing experimental data. Our theory thus offers a new avenue for understanding the boiling crisis, and therefore can serve as a guideline for the future boiling enhancement design.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

A comprehensive study on 21st-century refrigerants - R290 and R1234yf: A review

Saurabh Yadav · Jie Liu · Sung Chul Kim, et. al

Abstract:
Prolonged use of environment unfriendly refrigerants in high-grade energy systems has resulted in increased greenhouse gas emissions and ozone layer depletion. This has resulted in increased global warming. Therefore, it is important to analyze all the studies of any refrigerant before its use for the sustainable development of any system. The present review paper is an attempt to report all studies related to 21st-century refrigerants comprising sustainable refrigerants for longer use. In this regard, the historic evolution of refrigerants and their potential effect on global warming and ozone layer depletion are presented. Further, R290 and R1234yf are found to be promising alternatives amongst all refrigerants to be used as 21st-century refrigerants. An attempt has been made to provide a comprehensive study for these refrigerants, including their thermophysical properties, leakage in the compressor, leakage in the evaporator, leakage in the condenser, explosion characteristics due to leakage, and consequences due to leakage and explosion. In addition, a thorough study has been made for the use of oils, their importance, and their consequences in a refrigeration system. The study

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has also been made for the use of these refrigerants in flow boiling and condensation. The increased commercialization of electric vehicles and refrigerant use in electric vehicles may increase global warming in near future. Therefore, the discussion has been included to use these refrigerants in electric vehicle air conditioning systems. Finally, a short conclusion with the future scope is presented for the various aspect of 21st-century refrigerants.

CONDENSED MATTER PHYSICS

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Multi-objective optimization design for a double-direction liquid heating system-based Cell-to-Chassis battery module

Siqi Chen · Guangxu Zhang · Changjun Wu, et. al

Abstract:
Sub-zero temperature causes performance degradation, lifespan shortage, and even some safety issues of Li-ion battery cells, such as the internal short circuit. Preheating has become a critical issue for electric vehicle (EV) promotion in the high-latitude area or cold temperatures. To address this issue, a double-direction liquid heating-based Cell-to-Chassis (CTC) battery module is proposed for an extreme low-temperature environment (-40°C). Two cooling plates and the battery module are embedded in the chassis to reduce the component number. Besides, the volume energy density gets increased by 26.3%. The numerical calculation indicates that the proposed system is more efficient than the commonly utilized battery thermal management system (BTMS) in EVs. Moreover, the preheating effect with different heating intervals is compared; eight-minutes-preheating is proved to be more effective in preheating the battery module to 0°C with less energy consumption. Furthermore, a multi-objective optimization design is further carried out considering the heating rate, thermal safety, thermal uniformity, and energy cost. The impact of the mass flow rate in the mini-channels and the PTC heating film power are analysed through sensitivity analysis. Finally, the optimal design scheme is selected. The minimum, maximum, and volume average temperatures of the battery module are 273.2K, 296.7K, and 286.9K, respectively. Moreover, the temperature standard deviation is further reduced to 8.8K without much energy cost increment. This study guides for combing the efficient BTMS with the EV chassis for all-climate applications, especially with integrated preheating/cooling functions, which is feasible for the fast charging and cold environment applications, both the thermal management efficiency and the volume energy density can be effectively enhanced.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

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Condensation heat transfer performance in multi-fluid compact heat exchangers with wavy and strip fins

Ahmad Vaisi · Kourosh Javaherdeh · Rouhollah Moosavi

Abstract:
The effect of different geometrical parameters of wavy and strip fins in a three-fluid plate-fin compact heat exchanger on the condensation heat transfer in the middle heat exchanger has been experimentally investigated. The three-fluid heat exchanger consisted of three heat exchangers with strip and wavy fins. In the examined system, the hot and cold fluids flowed through the adjacent heat exchangers (strip channels), while the middle heat exchanger (wavy channels) was occupied with a single-component two-phase flow (condensed vapor). The Nusselt number, the friction factor, the heat transfer surface contribution between the middle heat exchanger and each of the adjacent heat exchangers, and the thermal performance factor were calculated using the measured data at the inlets and outlets of the heat exchangers, and by using the thermal balance equations between the fluids passing through the heat exchangers. In the examined heat exchanger, the hot and cold flows had a cross-direction with the two-phase fluid flow. The two-phase Reynolds number, the vapor quality, and the heat transfer surface contribution of the middle heat exchanger with the adjacent heat exchangers were 50–4800, 0.1–0.67, and 0.19–0.7, respectively. The results show that the two-phase flow pattern in the wavy channels of the middle heat exchanger is stratified and wavy. According to the findings, a higher thermal performance factor is observed when the ratio of the wavy channel heat transfer surface to the heat transfer surface of the cold or hot flows is closer to 1. Also, with higher wave amplitude to wavelength ratios, lower pitch to height ratio of the fins, the lower wavelength to the fin length ratios, and lower fin pitch to wave amplitude ratios are obtained a higher thermal performance factor.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Nonnegligible role of rigidity/flexibility for efficient CO2 separation in SILMs: A molecular dynamics simulation study

Timing Fang · Xiangshuai Meng · Guohui Zhou, et. al

Abstract:
By conducting the molecular dynamic simulation, the behavioral mechanism of gas separation and transfer in SILMs was investigated, in which the response to environment was selected as the critical factor in the separation. In this study, the dissolution and separation systems were employed to conduct a comparative analysis, while two types of membrane were tested in rigid/flexible SILMs. This study reported that the flexibility contributed to the stable existence of CO2 in the dissolution systems and effectively improved the selectivity of CO2 in the separation systems. Flexible

membranes could convert the main driving factors of separation, which was inconsistent with rigid membrane. Moreover, the externally applied forces were regulated from 0 to 8 kcal/mol-Å, the environmental response with the optimal range of intensity of separation was generated. This study highlighted the effect of flexibility on gas separation at a molecular level, which might help facilitate the development of 2D-materials.

International Journal of Heat and Mass Transfer (impact factor: 5.22) 2 区

Moist air condensation heat transfer enhancement via superhydrophobicity

Yu-Lieh Wu · Jia-Wei Zheng · M. Muneeshwaran, et. al

Abstract

The main objective of the present study is to experimentally investigate the moist air condensation behavior subject to hydrophilic and superhydrophobic surface with a much broader operating conditions such as different relative humidities (RH = 40 – 85%) and degree of subcooling (ΔTsub= 1 – 16 K). The flow visualization of condensation behavior showed that the main condensate departure mechanism of the hydrophilic surfaces is gravity-driven sliding. In contrast, the primary mechanisms for the superhydrophobic surfaces are direct jumping and bounced-jumping caused by the coalescence induced phenomena. The superhydrophobic surfaces yielded a maximum of 36% improvement in heat transfer coefficient at 85% relative humidity over the hydrophilic surfaces, while the enhancement is about 16% for 60% and 40% relative humidities. Similarly, the maximum heat transfer coefficient of 37 W m-2 K−1 is attained at the subcooling temperature of 16 K, and it is reduced to 31 W m-2 K−1 and 20 W m-2 K−1 respectively when the subcooling is reduced to 6 K and 1 K.

General Physics and Astronomy

International Journal of Multiphase Flow (impact factor: 3.18) 2 区

Atomization and droplet dynamics of a gas-liquid two-phase jet under different mass loading ratios

Hao Wu · Fujun Zhang · Zhenyu Zhang, et. al

Abstract

Atomization and droplet dynamics of a gas-liquid two-phase jet were investigated experimentally, with the particular interest in the influence of mass loading ratio (the ratio of droplet mass flow rate to the carrier-phase mass flow rate, ranging from 0.60 to 3.23) on the jet atomization. Droplet size and velocity at selected positions were obtained by employing Phase Doppler Particle Analyzer (PDPA), combined with

backlit illumination for spray visualization. Droplet transport characteristics are substantially influenced by the mass load ratio. Characterization of the local gas flow velocity by using droplets smaller than 5μm reveals a highly turbulent jet with Reynolds number exceeding 5×104, implying the possibility of droplet turbulent breakup. Critical equilibrium location xcrit between droplet breakup and coalescence is close to the nozzle exit and a positive correlation is found between mass loading ratio and xcrit. Exaltation of mass loading ratio increases the droplet size and decreases the velocity. Quantification of droplet collision outcome indicates a relatively high probability of coalescence, which explicates the downstream increasing of measured droplet Sauter mean diameter along the centerline of far-field jet.

International Journal of Multiphase Flow (impact factor: 3.18) 2 区

The influence of Stefan flow on the flow and heat-transfer characteristics of spherical-particle pair in supercritical water

Yingdong Wang · Mingyue Zhang · Huibo Wang, et. al

Abstract

For any flow process of mixtures containing dispersed reactive particles, especially highly concentrated particles, the particle-particle, and fluid-particle interactions are very complex and affect the overall flow. Supercritical water gasification technology is a complex multiphase-flow process that occurs in high-temperature reactors. Under these conditions, the components of the particle surface are heated and gasify to form a Stefan flow (i.e., a mass flow), which modifies fluid-particle interactions. The interaction between particles and the influence of Stefan flow cannot be ignored. In this work, we consider the simplest case of two identical spherical particles with different relative orientations and particle distances and discuss the flow and fluid-particle heat-transfer characteristics by numerical simulation of supercritical water flowing around the fixed two-particle system. We are particularly interested in the fluid-particle interactions with different particle configurations under the influence of Stefan flow. Three particle configurations are possible: tandem, cross, and parallel. The flow field, Nusselt number, drag coefficient, and temperature distribution around the particles are all analyzed. In comparison with a single particle, the two-particle configurations significantly affect the drag coefficient, Nusselt number, and vortex structure and Stefan flow strongly affects the wake vortex structure of two particles with small particle distance, reducing the drag coefficient and Nusselt number.

International Journal of Multiphase Flow (impact factor: 3.18) 2 区

Liquid film distribution around long gas bubbles propagating in rectangular capillaries

M. Magnini · F. Municchi · I. El Mellas, et. al

Abstract

We present a systematic analysis of the bubble and liquid film dynamics corresponding to the propagation of long, isolated gas bubbles, within rectangular capillary channels of cross-sectional aspect-ratio ranging from 1 to 8. Direct numerical simulations of the flow are performed using ESI-OpenFOAM v.1812 and its geometric Volume-Of-Fluid solver isoAdvector. The interface curvature, which enters the calculation of the surface tension force in the momentum equation, is calculated with a parabolic reconstruction method. This study covers a range of capillary and Reynolds numbers of, respectively, $0.005 \leqslant Ca \leqslant 1$ and $1 \leqslant Re \lesssim 1000$. The lubrication film surrounding the bubble is always resolved by the computational mesh, and thus the present results are representative of a perfectly wetting fluid. This study shows that rectangular cross-sections promote the formation of an extended liquid film covering the longer wall of the channel. This liquid film exhibits a saddle-like shape and its streamwise evolution varies depending on the channel shape and flow conditions. Although cross-sectional liquid film profiles and corresponding thicknesses are not constant along the bubble, in general the film deposited upon the shorter wall becomes thicker for increasing values of the aspect-ratio, while the thickness of the film deposited upon the longer wall obeys a Ca2/3/(1+Ca2/3) law which, provided that the channel hydraulic radius is the same, is independent of the aspect-ratio at sufficiently small Ca. An empirical correlation is proposed to predict the cross-sectional gas fraction and bubble speed as a function of a modified capillary number, embedding dependencies on both Ca and aspect-ratio, and converging to the asymptotic limit for a quasi-static flow when $Ca \to 0$.

GENERAL CHEMICAL ENGINEERING

Experimental Thermal and Fluid Science (impact factor: 3.12) 2 ☒

An experimental approach to evaluate drying kinetics and foam formation in inks for inkjet printing of fuel-cell layers

Paolo E. Santangelo · Marcello Romagnoli · Marco Puglia

Abstract

Inkjet printing is a deposition technique that has remarkably evolved over the last two decades, becoming widely employed for various applications. Notably, it has proven very promising for catalyst and ionomer layer deposition in assembling CCM (Catalyst Coated Membranes) of PEMFC (Polymer Electrolyte Membrane Fuel Cells). However, fast drying of the processed inks at the outlet often causes nozzle clogging and foam formation within the supply circuit often yields poor release: these are the main challenges in applying inkjet printing on a large scale. So, an experimental approach for the evaluation of drying kinetics and foam formation in inks typically employed in fuel-cell manufacturing is presented. It allows to evaluate ink printability, compare different inks quantitatively and assess the performance of

commonly used additives. Evaluation of drying kinetics is based on releasing ink droplets onto a support, then recording mass, ambient temperature and relative humidity. Foam formation is evaluated by filling a syringe with a known amount of ink, then injecting air at a set flow rate into the sampling volume: foam may be ultimately generated and its amount can be measured. Those relatively simple approaches were applied to various inks; validation was conducted by statistical analysis and by comparison with physical relationships and datasets available in the open literature.

Experimental Thermal and Fluid Science (impact factor: 3.12) 2 ☒

Effect of T-shaped micro-fins on pool boiling heat transfer performance of surfaces

Hantao Jiang · Xinyu Yu · Nian Xu, et. al

Abstract:

The saturated pool boiling heat transfer performance on the surface of T-shaped micro-fins was investigated with deionized water as working medium. Ten different T-shaped micro-fins surfaces were fabricated by machining method and the pool boiling experiments were carried out. By comparing the influence of varios parameters on the boiling heat transfer performance, the results showed that reducing the width of upper fin, increasing the gap or height of upper fin can improve the boiling heat transfer coefficient. With the increase of the width of the lower fins, the boiling heat transfer performance showed a different trend, that is, it increased at first and then decreased. The maximum boiling heat transfer coefficient of the surface S1 to the smooth surface was 184.7%. The visualization results showed that the merging of bubbles on the outside of the channel surface could strengthen the vertical and horizontal replenishment of the liquid to dry spot in the channel, thereby delaying the occurrence of critical heat flux and effectively reducing the wall temperature. The simplified semi-analytical model to determine the total heat flux of the micro channeal was proposed, which provided a heat flux prediction with an error of ± 40%.

Experimental Thermal and Fluid Science (impact factor: 3.12) 2 ☒

Dynamics of coherent avortex rings in a successively generated turbulent pulsed jet

Hao Fu · Chuangxin He

Abstract:

This work focuses on the dynamics of coherent vortex rings in a successively generated turbulent pulsed jet at a Reynolds number (Re) of 4 using planar particle image velocimetry (PIV). In the experiments, the vortex rings are issued into the free jet

mainstream by the reciprocation of a stepper-motor driven piston. The stroke-to-nozzle diameter ratio is 1.56, which produces compact vortex rings without a trailing jet in single pulsed jet flow without a free-jet mainstream. The flow fields generated by four pulsing frequencies are investigated, and the free jet at the same is also measured for comparison; the maximum dimensionless pulsing frequency () is 0.32. The effect of enhancement of turbulent fluctuation intensity (turbulence enhancement) is found to be closely related to the generation and structure of the vortex rings in a flow field. The compactness of the vortex rings is positively related to , as more compact vortex rings exhibit stronger entrainment and turbulence enhancement. The generated vortex rings convect at a speed of in the near field (, and then convect at a slightly decreased speed downstream. In addition, the distance between two adjacent vortex rings decreases with increased . Finally, the spatial dynamic mode decomposition (DMD) results show that the decay rate and the propagation time for an entire flow field subjected to vortex ring generation decrease almost linearly with increased . This indicates that vortex ring generation increases the propagation time and decay rate of these types of flow fields.

Experimental Thermal and Fluid Science (impact factor: 3.12) 2 区

Pool boiling experiment with Novec-649 in microchannels for heat flux prediction

Robert Kaniowski · Robert Pastuszko

Abstract:

Boiling dissipates significant amounts of heat as a result of small temperature differences between a wall and a fluid. For this reason, the heat transfer process is widely used across many industries, e.g. for cooling electronic devices, power sources, etc. In practice, heat dissipation from an electronic device occurs mainly during the controlled heat flux loss through the wall to the coolant. This mechanism was studied for boiling Novec-649 (GWP = 1) at atmospheric pressure on copper surfaces with 0.2 to 0.5 mm deep grooves milled in parallel. The resultant microchannels and the spaces between them were 0.2 mm, 0.3 mm, and 0.4 mm wide. The maximum heat flux for the surface with 0.4 mm deep and 0.3 mm wide microchannels was 274 kW/m2. The highest heat transfer coefficient, 22.3 kW/m2K, was obtained for the surface with a 0.5 mm deep and 0.3 mm wide microchannel. A twofold increase in the maximum heat flux and a fivefold increase in heat transfer coefficient were obtained compared to the smooth surface. The effect of geometric parameters on the heat exchange process was investigated for the heat flux density range of 6.6–274 kW/m2. Diameters and frequencies of departing vapor bubbles were determined experimentally with the use of a high-speed camera. A simplified model was proposed to determine the diameters, frequencies, and heat fluxes at different superheats. The model provided a heat flux prediction with a maximum mean deviation of 35 %.

Ⅱ Concentration

PHYSICS

Cu4S Cluster in "0-Hole" and "1-Hole" States: Geometric and Electronic Structure Variations for the Active CuZ* Site of N2O Reductase

Yang Liu, Sayanti Chatterjee, George E. Cutsail III, et al.

Abstract

The active site of nitrous oxide reductase (N2OR), a key enzyme in denitrification, features a unique μ4-sulfido-bridged tetranuclear Cu cluster (the so-called CuZ or CuZ* site). Details of the catalytic mechanism have remained under debate and, to date, synthetic model complexes of the CuZ*/CuZ sites are extremely rare due to the difficulty in building the unique {Cu4(μ4-S)} core structure. Herein, we report the synthesis and characterization of [Cu4(μ4-S)]n+ (n = 2, 2; n = 3, 3) clusters, supported by a macrocyclic {py2NHC4} ligand (py = pyridine, NHC = N-heterocyclic carbene), in both their 0-hole (2) and 1-hole (3) states, thus mimicking the two active states of the CuZ* site during enzymatic N2O reduction. Structural and electronic properties of these {Cu4(μ4-S)} clusters are elucidated by employing multiple methods, including X-ray diffraction (XRD), nuclear magnetic resonance (NMR), UV/vis, electron paramagnetic resonance (EPR), Cu/S K-edge X-ray emission spectroscopy (XES), and Cu K-edge X-ray absorption spectroscopy (XAS) in combination with time-dependent density functional theory (TD-DFT) calculations. A significant geometry change of the {Cu4(μ4-S)} core occurs upon oxidation from 2 (τ4(S) = 0.46, seesaw) to 3 (τ4(S) = 0.03, square planar), which has not been observed so far for the biological CuZ(*) site and is unprecedented for known model complexes. The single electron of the 1-hole species 3 is predominantly delocalized over two opposite Cu ions via the central S atom, mediated by a π/π superexchange pathway. Cu K-edge XAS and Cu/S K-edge XES corroborate a mixed Cu/S-based oxidation event in which the lowest unoccupied molecular orbital (LUMO) has a significant S-character. Furthermore, preliminary reactivity studies evidence a nucleophilic character of the central μ4-S in the fully reduced 0-hole state.

Proximity superconductivity in atom-by-atom crafted quantum dots

Schneider, Lucas, Ton, et al.

Abstract

Gapless materials in electronic contact with superconductors acquire proximity-induced superconductivity in a region near the interface1,2. Numerous proposals build on this addition of electron pairing to originally non-superconducting systems and predict intriguing phases of matter, including topological3,4,5,6,7, odd-frequency8, nodal-point9 or Fulde–Ferrell–Larkin–Ovchinnikov10 superconductivity. Here we investigate the most miniature example of the proximity effect on only a single spin-degenerate quantum level of a surface state confined in a quantum corral11 on a superconducting substrate, built atom by atom by a scanning tunnelling microscope. Whenever an eigenmode of the corral is pitched close to the Fermi energy by adjusting the size of the corral, a pair of particle–hole symmetric states enters the gap of the superconductor. We identify these as spin-degenerate Andreev bound states theoretically predicted 50 years ago by Machida and Shibata12, which had—so far—eluded detection by tunnel spectroscopy but were recently shown to be relevant for transmon qubit devices13,14. We further find that the observed anticrossings of the in-gap states are a measure of proximity-induced pairing in the eigenmodes of the quantum corral. Our results have direct consequences on the interpretation of impurity-induced in-gap states in superconductors, corroborate concepts to induce superconductivity into surface states and further pave the way towards superconducting artificial lattices.

Formation of the methyl cation by photochemistry in a protoplanetary disk

Berné, Olivier, Martin-Drumel

Abstract

Forty years ago, it was proposed that gas-phase organic chemistry in the interstellar medium can be initiated by the methyl cation CH3+ (refs. 1,2,3), but so far it has not been observed outside the Solar System4,5. Alternative routes involving processes on grain surfaces have been invoked6,7. Here we report James Webb Space Telescope observations of CH3+ in a protoplanetary disk in the Orion star-forming region. We find that gas-phase organic chemistry is activated by ultraviolet irradiation.

MATERIALS

Two-dimensional MXene membranes with biomimetic sub-nanochannels for enhanced cation sieving

Xu, Rongming, Kang, Yuan, Zhang, Weiming,, et al.

Abstract

Membranes with high ion permeability and selectivity are of considerable interest for

sustainable water treatment, resource extraction and energy storage. Herein, inspired by K+ channel of streptomyces A (KcsA K+), we have constructed cation sieving membranes using MXene nanosheets and Ethylenediaminetetraacetic acid (EDTA) molecules as building blocks. Numerous negatively charged oxygen atoms of EDTA molecules and 6.0 Å two-dimensional (2D) sub-nanochannel of MXene nanosheets enable biomimetic channel size, chemical groups and tunable charge density for the resulting membranes. The membranes show the capability to recognize monovalent/divalent cations, achieving excellent K+/Mg2+ selectivity of 121.2 using mixed salt solution as the feed, which outperforms other reported membranes under similar testing conditions and transcends the current upper limit. Characterization and simulations indicate that the cation recognition effect of EDTA and partial dehydration effects play critical roles in cations selective sieving and increasing the local charge density within the sub-nanochannel significantly improves cation selectivity. Our findings provide a theoretical basis for ions transport in sub-nanochannels and an alternative strategy for design ions separation membranes.

Ultra-resilient multi-layer fluorinated diamond like carbon hydrophobic surfaces

Hoque, Muhammad Jahidul, Li, Longnan, et al.

Abstract

Seventy percent of global electricity is generated by steam-cycle power plants. A hydrophobic condenser surface within these plants could boost overall cycle efficiency by 2%. In 2022, this enhancement equates to an additional electrical power generation of 1000 TWh annually, or 83% of the global solar electricity production. Furthermore, this efficiency increase reduces CO2 emissions by 460 million tons /year with a decreased use of 2 trillion gallons of cooling water per year. However, the main challenge with hydrophobic surfaces is their poor durability. Here, we show that solid microscale-thick fluorinated diamond-like carbon (F-DLC) possesses mechanical and thermal properties that ensure durability in moist, abrasive, and thermally harsh conditions. The F-DLC coating achieves this without relying on atmospheric interactions, infused lubricants, self-healing strategies, or sacrificial surface designs. Through tailored substrate adhesion and multilayer deposition, we develop a pinhole-free F-DLC coating with low surface energy and comparable Young's modulus to metals. In a three-year steam condensation experiment, the F-DLC coating maintains hydrophobicity, resulting in sustained and improved dropwise condensation on multiple metallic substrates. Our findings provide a promising solution to hydrophobic material fragility and can enhance the sustainability of renewable and non-renewable energy sources.

Ultra-thin lithium aluminate spinel ferrite films with perpendicular magnetic anisotropy and low damping

Zheng, Xin Yu, Channa, Sanyum, et al.

Abstract

Ultra-thin films of low damping ferromagnetic insulators with perpendicular magnetic anisotropy have been identified as critical to advancing spin-based electronics by significantly reducing the threshold for current-induced magnetization switching while enabling new types of hybrid structures or devices. Here, we have developed a new class of ultra-thin spinel structure Li0.5Al1.0Fe1.5O4 (LAFO) films on MgGa2O4 (MGO) substrates with: 1) perpendicular magnetic anisotropy; 2) low magnetic damping and 3) the absence of degraded or magnetic dead layers. These films have been integrated with epitaxial Pt spin source layers to demonstrate record low magnetization switching currents and high spin-orbit torque efficiencies. These LAFO films on MGO thus combine all of the desirable properties of ferromagnetic insulators with perpendicular magnetic anisotropy, opening new possibilities for spin based electronics.

CHEMISTRY

Plasmon-Induced Charge Transfer-Enhanced Raman Scattering on a Semiconductor: Toward Amplification-Free Quantification of SARS-CoV-2

Enduo Feng, Tingting Zheng, Xiaoxiao He, et al.

Abstract

Semiconductors demonstrate great potentials as chemical mechanism-based surface-enhanced Raman scattering (SERS) substrates in determination of biological species in complex living systems with high selectivity. However, low sensitivity is the bottleneck for their practical applications, compared with that of noble metal-based Raman enhancement ascribed to electromagnetic mechanism. Herein, a novel Cu2O nanoarray with free carrier density of 1.78×1021 cm−3 comparable to that of noble metals was self-assembled, creating a record in enhancement factor (EF) of 3.19×1010 among semiconductor substrates. The significant EF was mainly attributed to plasmon-induced hot electron transfer (PIHET) in semiconductor which was never reported before. This Cu2O nanoarray was subsequently developed as a highly sensitive and selective SERS chip for non-enzyme and amplification-free SARS-CoV-2 RNA quantification with a detection limit down to 60 copies/mL within 5 min. This unique Cu2O nanoarray demonstrated the significant Raman enhancement through PIHET process, enabling

rapid and sensitive point-of-care testing of emerging virus variants.

A nanoscale MOF-based heterogeneous catalytic system for the polymerization of N-carboxyanhydrides enables direct routes toward both polypeptides and related hybrid materials

Liu, Ying, Ren, Zhongwu, Zhang, Nannan, et al.

Abstract

Synthetic polypeptides have emerged as versatile tools in both materials science and biomedical engineering due to their tunable properties and biodegradability. While the advancements of N-carboxyanhydride (NCA) ring-opening polymerization (ROP) techniques have aimed to expedite polymerization and reduce environment sensitivity, the broader implications of such methods remain underexplored, and the integration of ROP products with other materials remains a challenge. Here, we show an approach inspired by the success of many heterogeneous catalysts, using nanoscale metal-organic frameworks (MOFs) as co-catalysts for NCA-ROP accelerated also by peptide helices in proximity. This heterogeneous approach offers multiple advantages, including fast kinetics, low environment sensitivity, catalyst recyclability, and seamless integration with hybrid materials preparation. The catalytic system not only streamlines the preparation of polypeptides and polypeptide-coated MOF complexes (MOF@polypeptide hybrids) but also preserves and enhances their homogeneity, processibility, and overall functionalities inherited from the constituting MOFs and polypeptides. Metal-based heterogeneous catalysts are widely employed in ring-opening polymerization (ROP) but up to now the exploration of metal-organic frameworks (MOF) as catalysts in ROP remains underdeveloped. Here, the authors report a MOF heterogeneous catalytic system for fast, controllable, air- and moisture-insensitive ring-opening polymerization of α-amino acid N-carboxyanhydrides, and its seamless integration with hybrid material preparation.

Stability and Equilibrium Structures of Unknown Ternary Metal Oxides Explored by Machine-Learned Potentials

Seungwoo Hwang, Jisu Jung, Changho Hong, et al.

Abstract

Ternary metal oxides are crucial components in a wide range of applications and have been extensively cataloged in experimental materials databases. However, there still exist cation combinations with unknown stability and structures of their compounds in oxide forms. In this study, we employ extensive crystal structure prediction methods, accelerated by machine-learned potentials, to investigate these untapped chemical spaces. We examine 181 ternary metal oxide systems, encompassing most cations

except for partially filled 3d or f shells, and determine their lowest-energy crystal structures with representative stoichiometry derived from prevalent oxidation states or recommender systems. Consequently, we discover 45 ternary oxide systems containing stable compounds against decomposition into binary or elemental phases, the majority of which incorporate noble metals. Comparisons with other theoretical databases highlight the strengths and limitations of informatics-based material searches. With a relatively modest computational resource requirement, we contend that heuristic-based structure searches, as demonstrated in this study, offer a promising approach for future materials discovery endeavors.

BIOLOGY

Insight into the soil aggregate-mediated restoration mechanism of degraded black soil via biochar addition: Emphasizing the driving role of core microbial communities and nutrient cycling

Chi Zhang, Xin Zhao, Aijie Liang, et al.

Abstract

Soil microbial communities are responsive to biochar application. However, few studies have investigated the synergistic effects of biochar application in the restoration of degraded black soil, especially soil aggregate-mediated microbial community changes that improve soil quality. From the perspective of soil aggregates, this study explored the potential microbial driving mechanism of biochar (derived from soybean straw) addition in black soil restoration in Northeast China. The results showed that biochar significantly improved the soil organic carbon, cation exchange capacity and water content, which play crucial roles in aggregate stability. The addition of biochar also significantly increased the concentration of the bacterial community in mega-aggregates (ME; 0.25–2 mm) compared with micro-aggregates (MI; <0.25 mm). Microbial co-occurrence networks analysis showed that biochar enhanced microbial interactions in terms of the number of links and modularity, particularly in ME. 16 S rRNA sequencing predicted that the expression of genes related to carbon (rbcL, acsA, gltS, aclB, and mcrA) and nitrogen (nifH and amoA) transformation increased after the addition of biochar. Furthermore, the functional microbes involved in carbon fixation (Firmicutes and Bacteroidetes) and nitrification (Proteobacteria) were significantly enriched and are the key regulators of carbon and nitrogen kinetics. Structural equation model (SEM) analysis further showed that the application of biochar promoted soil aggregates to positively regulate the abundance of soil nutrient conversion-related microorganisms, thereby increasing soil nutrient content and enzyme activities. These results provide new insights into the mechanisms of soil restoration through biochar addition.

PD-L1/PD-1 checkpoint pathway regulates hippocampal neuronal excitability and learning and memory behavior

Junli Zhao, Sangsu Bang, Kenta Furutani, et al.

Abstract

Programmed death protein 1 (PD-1) and its ligand PD-L1 constitute an immune checkpoint pathway. We report that neuronal PD-1 signaling regulates learning/memory in health and disease. Mice lacking PD-1 (encoded by Pdcd1) exhibit enhanced long-term potentiation (LTP) and memory. Intraventricular administration of anti-mouse PD-1 monoclonal antibody (RMP1-14) potentiated learning and memory. Selective deletion of PD-1 in excitatory neurons (but not microglia) also enhances LTP and memory. Traumatic brain injury (TBI) impairs learning and memory, which is rescued by Pdcd1 deletion or intraventricular PD-1 blockade. Conversely, re-expression of Pdcd1 in PD-1-deficient hippocampal neurons suppresses memory and LTP. Exogenous PD-L1 suppresses learning/memory in mice and the excitability of mouse and NHP hippocampal neurons through PD-1. Notably, neuronal activation suppresses PD-L1 secretion, and PD-L1/PD-1 signaling is distinctly regulated by learning and TBI. Thus, conditions that reduce PD-L1 levels or PD-1 signaling could promote memory in both physiological and pathological conditions.

Super-enhancer-driven TOX2 mediates oncogenesis in Natural Killer/T Cell Lymphoma

ianbiao Zhou, Sabrina Hui-Min Toh, Tze King Tan, et al.

Abstract

Background

Extranodal natural killer/T-cell lymphoma (NKTL) is an aggressive type of non-Hodgkin lymphoma with dismal outcome. A better understanding of disease biology and key oncogenic process is necessary for the development of targeted therapy. Super-enhancers (SEs) have been shown to drive pivotal oncogenes in various malignancies. However, the landscape of SEs and SE-associated oncogenes remain elusive in NKTL.

Methods

We used Nano-ChIP-seq of the active enhancer marker histone H3 lysine 27 acetylation (H3K27ac) to profile unique SEs NKTL primary tumor samples. Integrative analysis of RNA-seq and survival data further pinned down high value, novel SE oncogenes. We utilized shRNA knockdown, CRISPR-dCas9, luciferase reporter assay, ChIP-PCR to investigate the regulation of transcription factor (TF) on SE oncogenes. Multi-color immunofluorescence (mIF) staining was performed on an independent cohort of

clinical samples. Various function experiments were performed to evaluate the effects of TOX2 on the malignancy of NKTL in vitro and in vivo.

Results

SE landscape was substantially different in NKTL samples in comparison with normal tonsils. Several SEs at key transcriptional factor (TF) genes, including TOX2, TBX21(T-bet), EOMES, RUNX2, and ID2, were identified. We confirmed that TOX2 was aberrantly overexpressed in NKTL relative to normal NK cells and high expression of TOX2 was associated with worse survival. Modulation of TOX2 expression by shRNA, CRISPR-dCas9 interference of SE function impacted on cell proliferation, survival and colony formation ability of NKTL cells. Mechanistically, we found that RUNX3 regulates TOX2 transcription by binding to the active elements of its SE. Silencing TOX2 also impaired tumor formation of NKTL cells in vivo. Metastasis-associated phosphatase PRL-3 has been identified and validated as a key downstream effector of TOX2-mediated oncogenesis.

Conclusions

Our integrative SE profiling strategy revealed the landscape of SEs, novel targets and insights into molecular pathogenesis of NKTL. The RUNX3-TOX2-SE-TOX2-PRL-3 regulatory pathway may represent a hallmark of NKTL biology. Targeting TOX2 could be a valuable therapeutic intervene for NKTL patients and warrants further study in clinic.

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Ⅲ Calling for papers

IEEE ICC'24 NEXTG-WISEC 2024

Submission deadline: **Jan 20, 2024**
Conference date: **Jun 13, 2024 - Jun 13, 2024**
Full name: **IEEE ICC'24 NextG-WiSec 2024 : IEEE NextG-WiSec: The Nineth IEEE Workshop on NextG (6G and beyond) Wireless Security in conjunction with IEEE ICC 2024, 9–13 June 2024 - Denver, CO, USA**
Location: **Denver, CO, USA**
Website: https://sites.google.com/view/ieee-nextg-wisec-2024/

Future wireless systems will require a paradigm shift in how they are networked, organized, configured, optimized, and recovered automatically, based on their operating situations. Emerging Internet of Things (IoT) and Cyber-Physical Systems (CPS) applications aim to bring people, data, processes, and things together, to fulfill the needs of our everyday lives. With the emergence of software defined networks, adaptive services and applications are gaining much attention since they allow automatic configuration of devices and their parameters, systems, and services to the user's context change. It is expected that upcoming Sixth Generation and Beyond (6G&B) wireless networks, known as more than an extension to 4G, will be the backbone of IoT and CPS, and will support IoT systems by expanding their coverage, reducing latency and enhancing data rate. However, there are several challenges to be addressed to provide resilient connections supporting the massive number of often resource constrained IoT and other wireless devices. Hence, due to several unique features of emerging applications, such as low latency, low cost, low energy consumption, resilient and reliable connections, traditional communication protocols and techniques are not suitable.

In this regard, it is crucial to have security by design in 5G and beyond wireless networks, considering the constraints imposed by heterogeneous IoT and CPS systems. Our aim is to promote the development of 5G security by design. The proposed IEEE ICC 2024 workshop NextG-WiSec will serve as a forum for researchers from academia, government, and industries, to exchange ideas, present new results, and provide future visions on these topics.

Topics include, but not limited to:

- NextG & Beyond architecture with security and privacy considerations
- Security for new service delivery models
- AI and Machine Learning for 6G and Beyond security
- Verticals and business (non-technical) NextG and Beyond security requirements and solutions

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- Big data analytics tools/techniques in NextG & Beyond Security
- Advances in lightweight cryptography and IoT/CPS security
- Wireless virtualization and slicing security
- Authentication, authorization, and accounting for NextG & Beyond security
- AI and Machine Learning for NextG & Beyond security
- Diameter security in NextG & Beyond
- Quantum Safe Cryptography for NextG & Beyond
- Secure Integration of IoT/CPS and Cloud Computing
- Secure integration of IoT /CPS and other networks
- Secure Device-to-Device communications in NextG & Beyond
- Intrusion Detection/Prevention Techniques and System Integrity
- Secure data storage, communications, and computing
- Energy efficient security in IoT and CPS
- Heterogeneous system modeling for NextG security
- Secure sensing and computing techniques in NextG & Beyond
- Big data analytics for NextG & Beyond security
- Secure, privacy aware and trustworthy IoT/CPS communications
- Trust models and trust handling/propagation for NextG & Beyond security
- Physical layer security for NextG & Beyond
- NextG & Beyond security standardization

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ALGALBBB 2024

Submission deadline: **Jan 26, 2024**
Conference date: **Jun 10, 2024 - Jun 12, 2024**
Full name: **International Conference on Algal Biomass, Biofuels and Bioproducts**
Location: **Hilton Clearwater Beach, Florida**
Website: **https://www.elsevier.com/events/conferences/international-conference-on-algal-biomass-biofuels-and-bioproducts**

Themes in algae research including microalgae, macroalgae and cyanobacteria:

- Algal Biotechnology - Molecular Engineering
- Algal Biology - Biodiversity and Bioprospecting of Algae for Biofuels and Bioproducts
- Algal Biotechnology - Metabolic Regulation of Algae for Biofuels and Bioproducts
- Algal Cultivation - Phototrophic Systems in Open Ponds
- Algal Cultivation - Phototrophic Systems in Photobioreactors
- Algal Cultivation - Heterotrophic Systems, including utilization of waste waters for algal production
- Bioreactor Design, Engineering and Control
- Algal Harvesting and Extraction Systems
- Engineering of Biorefinery Systems, Technologies, and End-to-end Integration
- New Technologies in Support of Algal Research - Areas of Separation, Refining, Detection, Characterization and Analysis
- Engineering Technologies for Algal Biofuels - Thermal Catalytic and Non-Catalytic, and Enzymatic systems
- Bioproducts from Algae Including High-Value Products and Co-products
- Life Cycle, Technoeconomic, and Sustainability Modeling and Analysis of Algal Production and Fuel Cycle Systems
- Nutrient Recycling and Management
- Algal Biology – Improving photosynthetic growth and biomass productivity

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SCOPUS-IDITR 2024

Submission deadline: **Nov 25, 2023**
Conference date: **May 23, 2024 - May 25, 2024**
Full name: **2024 3rd International Conference on Innovations and Development of Information Technologies and Robotics (IDITR 2024)**
Location: **HongKong**
Website: https://iditr.org/

2024 3rd International Conference on Innovations and Development of Information Technologies and Robotics (IDITR 2024) will be hosted in Hong Kong, China during May 23-25, 2024, which is co-organized by Hong Kong Polytechnic University and Hong Kong Society of Mechanical Engineers(HKSME)， supported by IEEE Chengdu Section.

This conference will include invited expert keynote speakers, oral presentations, special workshops. IDITR 2024 will provide a forum for researchers and engineers in both academia and industry to exchange the latest innovations and research advancements in Innovation and Emerging Robotics. IDITR 2024 also provides the attendees the chances to identify the emerging research topics, as well as the future development directions in all field of robotics science. Also, the aim of the conference is to transform of fundamental research into institutional and industrialized research and to convert applied exploration into real time application.

We warmly welcome prospective authors to submit your research papers to IDITR 2024, and share your latest research results and valuable experiences with other top-scientists, engineers and scholars from all over the world.

● Publication & Indexing

1. All submissions will be peer reviewed, and all the accepted papers will be published in The Conference Proceeding of IDITR 2024 , the publisher will submit to Engineering Village, Scopus, Web of Science and other databases for review and indexing after publication.
2. Selected papers with high quality will be recommended to publish in international journal.

The topics of interest for submission include, but are not limited to:

- Active media technology
- Adaptive and learning control
- Aerial and underwater robotics
- Artificial intelligence, neuro control and fuzzy control for Robotics
- Big data and cloud computing
- Biomimetics and bio-inspired systems
- Collaborative control systems
- Computational dynamical systems
- Computer network and internet modeling

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- Data mining and knowledge discovery
- Feedback and decentralized control
- Fractal geometry
- Humanoid robots: new developments
- Hybrid control and hybrid dynamical systems
- Intelligent algorithms and applications
- Intelligent and biological control systems
- Intelligent communication systems
- Intelligent mechatronics and robotics
- Machine learning for robotics
- Machine vision for robotics
- Multi-agent systems and applications
- Neural networks, fuzzy systems and soft computing algorithms
- New approaches in automation and robotics
- Parallel, distributed computing
- Power system analysis and control
- Process control and industrial automation
- Robotics and intelligent vehicles
- Sensing and perception
- Sensor data analysis and system diagnosis
- Sensor design, integration and fusion
- Sensor networks
- Sensors based control and automation
- Service science, management and engineering
- System control and optimal control
- System modeling, identification and simulation
- Tele-robotics, medical robotics
- Traffic modeling and congestion control
- Vision and image processing
- Wavelet algorithm and multi-wavelet

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DIS 2024

Submission deadline:	**Jan 15, 2024**
Conference date:	**Jun 2, 2024 - Jun 7, 2024**
Full name:	**7th International Conference on the Dynamics of Information**
Location:	**Kalamata, Greece**
Website:	https://dis2024.ujep.cz/

The 7th International Conference on Dynamics of Information Systems (DIS 2024) will be held as a physical-virtual conference on June 2-7, 2024, in Kalamata, Greece. This conference, a continuation of the highly successful DIS series held in the United States and Europe, investigates the intersections and uncharted domains in information science, optimization, operations research, machine learning, and artificial intelligence. The DIS 2024 includes contributions from researchers and practitioners in information science, operations research, computer science, optimization, and electrical engineering. DIS 2024 discusses topics from theoretical, algorithmic, and practical points of view, providing the readers with information, theories, and techniques.

The topics of interest:

DIS 2024 welcomes high-quality submissions on the broad topics of information science, optimization, operations research, machine learning, artificial intelligence, their real-life applications, and their interactions.

Moreover, more specific submission topics for both longer and shorter papers may include, but are **not limited to:**

Optimization (theory, methods, and applications)

- Operations research & management science
- Machine learning
- Data science & big data
- Dynamical systems and control
- Information science
- Uncertainty modelling
- Quantum Information
- Applications in robotics, economics, energy, environmental sciences, and other areas
-

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