2021 Annual Meeting of Energy Sub-Alliance of University Alliance of the Silk Road

Nov. 18th, 2021, Xi'an, Shaanxi, China

Sponsored by
Energy Sub-Alliance of University Alliance of the Silk Road
University Alliance of the Silk Road
School of Energy and Power Engineering, XJTU
Overseas Expertise Introduction Project for Discipline Innovation, XJTU

Organized by

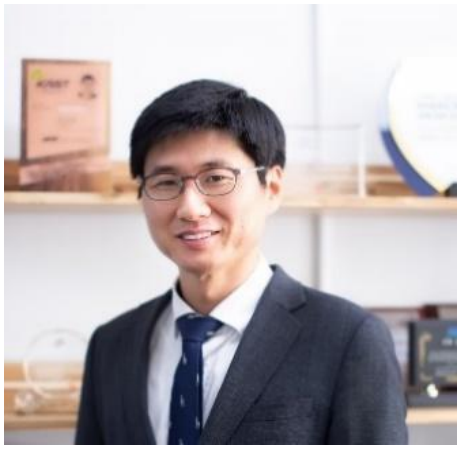
Key Laboratory of Thermos-Fluid Science and Engineering of Ministry of Education
International Joint Research Laboratory of Thermal Science and Engineering
International Joint Research Center for Heat and Mass Transfer in Energy and Environment Engineering

PROGRAM

Online: Zoom (Room: 764 324 2886, Pass: 20211118)

Time: 14:00 – 16:30pm Beijing Time,Nov. 18th, 2021

Theme: Energy storage and saving Zoom number: 764 324 2886 (Pass: 20211118)		
Time	Content	Chair
14.00–14:10	Opening Ceremony	Prof. Qiuwang Wang
14:10–14:40	Title: 2D Pseudocapacitive Nanomaterials for High Energy- and High Power-Oriented Applications of Supercapacitors Speaker: Dr. Ho-Seok Park, Sungkyunkwan University	Prof. Qiuwang Wang
14:40–15:10	Title: Microencapsulation of phase change materials for cold energy storage applications Speaker: Dr. Yongliang Li, University of Birmingham	
15:10–15.40	Title: Study and application of energy storage technology in the new generation distributed system Speaker: Dr. Mingjia Li, XI'an Jiaotong University	
15:40-16:10	Title: State of the art and research directions for cold thermal energy storage (CTES) materials at sub-zero temperatures Speaker: Dr. Lizhong Yang, Nanyang Technological University	
16:10–16:30	Introduction to international journal: Energy storage and saving	



Dr. Ho Seok Park

Sungkyunkwan University

Ho Seok Park is a professor of Chemical Engineering at the Sungkyunkwan University (SKKU), an adjunct professor at the Samsung Advanced Institute for Health Science & Technology (SAIHST), and a director of research center for 2D Redox Energy Storage (2DRES). He received his Ph.D. from Korea Advanced Institute of Science & Technology (KAIST) in 2008 and worked as a Postdoctoral Researcher in the Department of Biological Engineering at Massachusetts Institute of Technology (MIT) from 2008 to 2010. His current research interests focus on energy storage and conversion based on 2D and carbon nanomaterials. He has published >220 peer-reviewed papers in the top journals and being taking associate editor, editorial board member, and guest editor in the SCI(E) journals of "Advanced Functional Materials", "InfoMat", "Energy Storage & Saving", "Batteries & Supercaps", "Carbon Letters", and "Macromolecular Research".

Title

2D Pseudocapacitive Nanomaterials for High Energy- and High Power-Oriented Applications of Supercapacitors

Abstract

Supercapacitors (SCs) are an electrochemical energy storage device that can fill the gap between batteries and electrolytic capacitors. However, the widespread applications of commercialized carbon-based SCs are limited by their energy density, arising from their physical charge storage mechanism, which is by far lower than that of batteries. Moreover, the high-power applications of SCs are also limited by the slower kinetics than electrolytic capacitor due to the diffusion and distribution of ions onto the tortuous porous surface. In this talk, I will introduce our recent progress on the rational design of 2D pseudocapacitive materials for high energy- and high power-oriented SCs applications.[1] Firstly, I will address our contribution to the improvement of pseudo-capacitance by the molecular level surface redox sites of 2D pseudocapacitive nanomaterials such as P-doped graphene and black phosphorus.[2,3] In addition to energy aspect, we will focus on the kinetics feature of 2D MXenes, correlating with the multiscale structure and chemistry for ultrahigh power and high frequency response.[4]

References

[1] Puritut Nakhanivej, Qingyun Dou, Peixun Xiong, Ho Seok Park, "Two-Dimensional Pseudocapacitive Nanomaterials for High-Energy and High-Power-Oriented Applications of Supercapacitors", ***Acc. Mater. Res.***, 2, 86–96 (2021).

[2] Puritut Nakhanivej, Xu Yu, Sul Ki Park, Soo Kim, Jin Yong Hong, Hae Jin Kim, Wonki Lee, Jun Yeon Hwang, Ji Eun Yang, Chris Wolverton, Jing Kong, Manish Chhowalla, Ho Seok Park, "Revealing Molecular-Level Surface Redox Sites of Controllably Oxidized Black Phosphorus Nanosheets", ***Nat. Mater.***, 18, 156–162 (2019).

[3] Xu Yu, Hae Jin Kim, Jin-Yong Hong, Young Mee Jung, Kideok D. Kwon, Jing Kong, Ho Seok Park, "Elucidating surface redox charge storage of phosphorus-incorporated graphenes with hierarchical architectures", ***Nano Energy***, 15, 576–586 (2015).

[4] Girish Sambhaji Gund, Jeong Hee Park, Rana Harpalsinh, Manikantan Kota, Joo Hwan Shin, Tae-il Kim, Yury Gogotsi, Ho Seok Park, "MXene/Polymer Hybrid Materials for Flexible AC Filtering Electrochemical Capacitors", ***Joule***, 3, 1–13 (2019).

Dr. Yongliang Li

University of Birmingham

Professor Yongliang Li is a Chair of Thermal Energy Engineering in the School of Chemical Engineering and the Birmingham Centre for Energy Storage at the University of Birmingham, UK. His research focuses on thermal energy conversion, storage, and thermal management. He is leading several grant challenge projects on thermal energy storage and heating/cooling decarbonisation funded by UKRI and he is also the coordinator of an EC funded RISE project to developing low-carbon cooling technology in collaboration with 17 international partners. He has published 100+ peer reviewed articles with a h-index of 32. He has won several prestigious awards including the Dorothy Hodgkin Award, the CSC Award, and the Collaborative Development Award for his academic achievements.

Title

Microencapsulation of phase change materials for cold energy storage applications

Abstract

The ability of thermal energy storage (TES) systems to facilitate energy savings, renewable energy use and reduce environmental impact has led to a recent resurgence in their interest. However, the cold thermal storage is still the Cinderella in thermal energy storage, receiving little attention in the energy debate so far, although it can play a vital role in the cold chain foundation. The microencapsulation of phase change materials was turned to be a viable technique for cold thermal storage. In this presentation I will discuss our work on the microencapsulation of volatile phase change materials, covering both the formulation process and mechanism, as well as the thermal and theological behaviors of the MPCMs and its slurry.

Dr. Mingjia Li
Xi'an Jiaotong University

Dr. Ming-Jia Li is a professor of School of Energy and Power Engineering, Xi'an Jiaotong University. She was awarded international awards and national awards such as Asian Young Scientist Award, National Young Top-notch Talents Program, Thousand Talents Program of Shannxi Province, Outstanding Young Investigator Award in Shannxi Province, National Innovative Talents Support Plan of China Postdoctoral Foundation, Outstanding Doctoral Dissertation of Shaanxi Province, and First Prize of Provincial Natural Science Award etc. She serves as the associate editor of journal of Applied Thermal Engineering. She is also, amounts other, on the editorial boards of other 4 international journals, the reviewers for numerous international journals, and the secretary general of International Conference on Supercritical CO_2 Power System.

She was granted her bachelor degree from University of Liverpool (U.K) and master degree from University of Nottingham (U.K.). She obtained the doctoral degree from Xi'an Jiaotong University with the joint program cooperated by Columbia University (U.S).

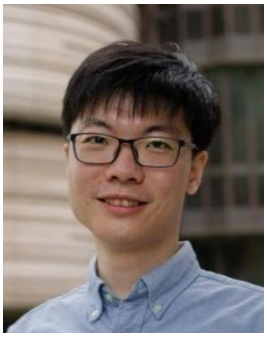
She mainly focuses on Energy-saving theories & new methods in efficient energy utilization, Supercritical CO_2 power system and Biomass carbon sequestration. As a principle investigator, she hosts some national research programs, eg. the Key Project of National Science Foundation of China-subtopics, National Science Foundation of China etc. She published many journal papers in top international journals with the h-index of 34. Among them, 13 papers are selected in Essential Science Indicators (1% top). She has 26 patents of invention and 7 software copyrights. She also delivered more than 10 plenary / invited talks and served as session chairs in international conferences.

Tittle

Study and application of energy storage technology in the new generation distributed system

Abstract

Energy storage system is a key player in the renewable energy market based on the objectives of carbon neutrality. It presents the important role of peak load shifting in the new generation distributed system with the characteristics of "Source-Network-Load-Storage". The purpose of this study is to assist to realize the efficient, stable and economical operation of the new distributed system. In this study, some dominant technologies of storage material and storage structure are analyzed. Besides that, the dynamic response characteristics of the power generation frequency and efficiency of the energy storage system with a microgrid real-time load are studied.



Dr. Lizhong Yang

Nanyang Technological University

Lizhong Yang is a research associate at the Thermal Energy Systems Lab and Surbana Jurong – NTU Corporation Lab in Nanyang Technological University, Singapore. His research focuses on renewable energy and energy saving-related topics, including thermal energy storage technologies, concentrating solar power, carbon capture, data center energy saving and poly-generation, liquefied natural gas cold energy recovery and utilization.

Tittle

State of the art and research directions for cold thermal energy storage (CTES) materials at sub-zero temperatures

Abstract

Energy storage is playing an increasingly important role in combating climate change. Compared to the extensive research interests in creating new electrochemical storage materials, less attention is paid to develop thermal energy storage materials. However, thermal energy, including heating and cooling, is the most crucial end-use in the residential sector, accounting for around 50-80% of the total energy consumption. Among that, cooling and refrigeration already consume 25–30% of the global electricity production, and this consumption is expected to surge 33-fold by 2100. Meanwhile, despite the massive amount of energy dedicated to producing cold energy, various cold sources are not efficiently utilized or even generally wasted. The fast-growing demand and production of cold energy, along with the newly trending concept of "cold economy," triggered the urgent need to develop advanced cold thermal energy storage materials, systems, and applications. This work provides a systematic and comprehensive review of a wide range of existing and potential cold thermal energy storage materials at sub-zero temperatures (from around −270 °C to below 0 °C). Current and future applications of cold thermal energy storage materials, including recovering waste cold energy, enhancing refrigeration systems' performances, and improving renewable energy integration, are analyzed with compatible storage materials. Moreover, by identifying the research gaps where further efforts are needed, the review also outlines the potential development directions of the next generation cold thermal energy storage materials.

The Key Laboratory of Thermo-Fluid Science and Engineering of Ministry of Education was officially approved by the State Ministry of Education in November 2010 for preparing the establishment.

In order to meet the national important needs for energy-saving & emission reduction and development of frontier science, this Laboratory is aimed at conducting a series of foresight and strategic systematic researches related to the basic scientific issues originated from the processes of energy transport and utilization. The research activities of the Laboratory are focused on five areas: mechanism and technology in heat and mass transfer; thermophysical properties of fluids and new working fluids for energy-saving and environment-protection; multiscale numerical simulation in flow and heat transfer; technology of new energy and energy saving. The Laboratory is expected to be a comprehensive interdisciplinary creative research center and a base in the fields of energy transport and utilization, a teaching center for the courses of fluid mechanics, thermodynamics and heat transfer, and an education center for the talents of energy and power engineering. The researches executed in the Laboratory are characterized by their fundamental, comprehensive and international features, with attention being paid on the intersecting of disciplines. The culture of the laboratory is: Innovation, Harmony and Open.

There are currently 55 full-time faculty members in the Laboratory, among whom are 30 professors and 19 associate professors. Among the members there are two Academician of the Chinese Academy of Science, three National Outstanding Teachers, one National Expert with Outstanding Contributions, two Leading Talents of Million People Plan, two Changjiang Scholars, two Youth Changjiang Scholars, seven Distinguished Young Scholars or Excellent Young Scholars by the National Natural Science Foundation of China, one selected in the National New-Century Talent Project, three awarded as Thousand Youth Talents, 18 recipients of MOE Cross-Century & New-Century Excellent Talents, three recipients for the authors of National 100 Excellent Doctoral Dissertations, and eight specially hired professors of XJTU Tengfei Project. Additionally, there are over 200 graduate students and several postdoctoral researchers in the Laboratory. It is a research group with appropriate age-structure, strong research-ability and international influences.

Email: thermofluid@mail.xjtu.edu.cn

Website: http://thermofluid.xjtu.edu.cn

International Joint Research Laboratory of Thermal Science and Engineering (IJRL-TSE) consists of Xi'an Jiaotong University in China and several prestigious universities and academic institutions abroad. The main part of IJRL-TSE in Xi'an Jiaotong University is Key Laboratory of Thermo-Fluid Science and Engineering of Ministry of Education, in collaboration with the team of Thermo-Fluid-Solid Coupled Mechanics and Structural Response at National Laboratory of Mechanical Structural Strength and Vibration, and Shaanxi Province Engineering Lab of Turbomachinery and Power Equipment.

The international partners include Heat Transfer Lab (Prof. Terrence W. Simon as the director) and Particle technology Lab (Prof. David Y. H. Pui as the director, member of the American Academy of Engineering,) at University of Minnesota, Prof. Jason Reese (fellow of the American Physical Society) at University of Edinburgh UK, senior scientist Qinjun Kang at Earth and Environment Science Division of Los Alamos National Lab USA, Prof. Bengt Sundén at Lund University Sweden, Prof. Peiwen Li at University of Arizona USA, Prof. Yitung Chen at University of Nevada-Las Vegas USA, Prof. Shuguang Li at University of Nottingham UK, and Prof. Man Yeong Ha at Pusan National University ROK. Researches of the above universities and teams are in the forefront of energy and environmental science and engineering.

IJRL-TSE boasts 6 academicians, including Prof. Wenquan Tao and Prof. Ya-Ling He, members of the Chinese Academy of Sciences, Prof. David Y.H. Pui, E. M. Sparrow and G. R. Goldstein, members of the American Academy of Engineering, and J. Reese, a member of the Royal Academy of Engineering.