The 1st World Conference on Multiphase Transportation, Conversion & Utilization of Energy (MTCUE-2022)

Conference Program

Organizers:

Xi'an Jiaotong University

State Key Laboratory of Multiphase Flow in Power Engineering

Founding Chair:

Prof. Liejin Guo

Prof. Aibing Yu

27-31 Jul. 2022 Xi'an, China

Contents

1. Conference Introduction

The 1st World Conference on Multiphase Transportation, Conversion and Utilization of Energy (MTCUE-2022) is being held online from 27-30 July 2022 in accordance with the requirements of the National Prevention Policy. The conference is hosted by the State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University.

MTCUE has arranged 11 plenary presentations and 306 session presentations (74 foreign presentations); the participants come from 21 different countries and 123 different units.

The Annual Multiphase Flow Conference will be organized around 44 sessions and the following 11 topics：

1) Interfacial Phenomena &Mechanisms;

2) Multiphase Flow and Heat Transfer;

3) Reactive Multiphase Flow;

4) Modeling and Numerical Methodologies;

5) Measurement and Instrumentation;

6) Multiphase Flow in Industrial Process;

7) Resource Exploitation (rare-earth, oil & gas);

8) Organic Waste Conversion and Utilization;

9) Hydrogen Production and Utilization;

10) Low Carbon Technology and New Energy;

11) Interdisciplinary Multiphase Flow(medicine bionic,..)

We wish the participating experts and scholars, as well as teachers and students, to stimulate new ideas and perspectives during the extensive and in-depth exchanges, which will contribute to the rapid development of multiphase flow science and technology research and provide more powerful support for global economic and social development.

2. Participation Guide

2.1 Meeting Communication Instructions

（1） All presenters are requested to enter the corresponding Zoom meeting room 10 minutes in advance before the start of the session, and the entrance of the session will be subsequently sent to the presenters separately.

（2） All presentations will be shared live by the presenters via Zoom meeting.

（3） The total duration of each Keynote is 30 minutes, with 25 minutes for presentations and 5 minutes for questions.

（4） The total duration of each oral presentation is 15 minutes, with 15 minutes for the presentation and 5 minutes for questions.

（5） All participants can enter each venue through the Koushare Meeting link to watch the live broadcast of your interest.

2.2 Instructions for session chairman

（1） The session chairs are responsible for chairing the presentations and Q & A sessions for the entire session.

（2） Session Chairs are required to enter the Zoom meeting 20 minutes in advance and check that the presenters are already present, with one volunteer per venue to assist.

（3） Sessions begin with the session chair introducing himself/herself. For copyright protection, please remind the audience not to take photos, screenshots or recordings of the presentation PPT.

（4） The session chairs need to keep a tight rein on time and the session chairs need to record the authors and units of absent presentations and report back to the program committee chair.

（5） During the question and answer period, the session chair should try to avoid

prolonged questions from a particular audience member and excessive explanations by the presenter, thus leaving no time for questions from the rest of the audience.

2.3 Contact information of the conference group

Secretaries:

Bofeng Bai （白博峰）：13060370272

Hui Jin （金　辉）：13772493420

Maochang Liu （刘茂昌）：18220801991

Online Venue Liaison Group:

Gang Wang （王　刚）：15202970443

Yang Yu （于　洋）：13572090964

Qiang Xu （徐　强）：15399451626

3. General Program of the Conference

Time(Beijing)		安排	Arrangement
July 28	08:30-11:40	会场报告 （Session 1-8）	Session reports （Session 1-8）
	14:20-18:00	开幕式	Opening ceremony
July 29	08:00-10:00	大会报告	Plenary Lectures
	10:00-12:10	会场报告 （Session 9-16）	Session reports （Session 9-16）
	14:30-18:00	会场报告 （Session 17-24）	Session reports （Session 17-24）
July 30	08:00-08:40	大会报告	Plenary Lectures
	08:40-11:50	会场报告 （Session 25-34）	Session reports （Session 25-34）
	14:30-16:00	会场报告 （Session 35-44）	Session reports （Session 35-44）
	16:10-18:00	闭幕式	Closing ceremony

Ceremonies & Plenary Lectures

Activity	Chair	Speaker	Time (Beijing)	Zoom Meeting ID (Room Password)	Live Link	Volunteer
Opening Ceremony	Bofeng Bai Xi'an Jiaotong University, China	 Liejin Guo Xi'an Jiaotong University, China	28/7/2022 Thursday 14:30-14:50	865 8269 4501 (186948)	https://www.koushare.com/lives/room/051126	Nianduo Song +8618940961327 songnianduo@stu.xjtu.edu.cn
		 Tassos G. Karayiannis Brunel University London, UK				
Closing Ceremony	Bofeng Bai Xi'an Jiaotong University, China	 Bofeng Bai Xi'an Jiaotong University, China	30/7/2022 Saturday 17:30-18:00			

Time	**Chair**	Plenary Lectures	**Time (Beijing)**	**Zoom Meeting ID (Room Password)**	**Koushare Meeting**		**Principal Telephone**
July 28 14:20-18:30 (China Time)	Bofeng Bai Tassos G. Karayiannis Aibing Yu	Davide Del Col	28/7/2022-Thursday 14:50-15:30	Zoom: 865 8269 4501 Password:186948	https://www.koushare.com/lives/room/833966		张凯妮 18292877341 丁振 19159501412
		Khellil Sefiane	28/7/2022-Thursday 15:30-16:10				
		Raffaella Ocone	28/7/2022-Thursday 16:30-17:10				
		Yulong Ding	28/7/2022-Thursday 17:10-17:50				
		Demetrios Papageorgiou	28/7/2022-Thursday 17:50-18:30				
July 29 08:00-10:00 (China Time)	Xiaoshu Cai	Gretar Tryggvason	29/7/2022-Friday 8:00-8:40				
		Gherhardt Ribatski	29/7/2022-Friday 8:40-9:20				
		Jinliang Xu	29/7/2022-Friday 9:20-10:00				
July 30 08:00-08:40 (China Time)	Jinliang Xu	Bofeng Bai	30/7/2022-Saturday 8:00-8:40				
July 30 16:10-18:00 (China Time)	Bofeng Bai	Hui Jin	30/7/2022-Saturday 16:10-16:50				
		Maochang Liu	30/7/2022-Saturday 16:50-17:30				

Report Arrangement for July 28, 2022

Time	Session	Topic	Zoom Meeting ID (Room Password)	Koushare Meeting		Principal Telephone
July 28 08:30-11:40 (China Time)	1 Topic 1	Interfacial phenomena & mechanisms	Zoom: 924 6287 3469 Password:864067	https://www.koushare.com/lives/room/331118		唐灿芳 18777448583
	2 Topic 2	Multiphase flow and heat transfer	Zoom: 927 9681 4545 Password:909964	https://www.koushare.com/lives/room/240190		刘裕凯 18810788712
	3 Topic 8	Organic waste conversion and utilization	Zoom: 970 0600 1020 Password:666888	https://www.koushare.com/lives/room/602909		陈秉学 15022601890
	4 Topic 4	Modeling and numerical methodologies	Zoom: 938 9669 8273 Password:618486	https://www.koushare.com/lives/room/074632		任维熙 18729792665
	5 Topic 5	Measurement and instrumentation	Zoom: 987 6477 2100 Password:823168	https://www.koushare.com/lives/room/478671		余嘉怡 18851020505

	6 Topic 6	Multiphase flow in industrial process	Zoom: 978 3162 9384 Password:996326	https://www.koushare.com/lives/room/336666		杨思怡 18846927795
	7 Topic 3&7	Reactive multiphase flow Resource exploitation (rare-earth, oil & gas)	Zoom: 927 7402 9148 Password:548141	https://www.koushare.com/lives/room/575628		李腾腾 18437058280
	8 Topic 2&8	Multiphase flow and heat transfer Organic waste conversion and utilization	Zoom: 982 1082 5736 Password:252799	https://www.koushare.com/lives/room/942637		王江 18468189134

Report Arrangement for July 29, 2022

Time	Session	Topic	Zoom Meeting ID (Room Password)	Koushare Meeting		Principal Telephone
July 29 10:00-12:10 (China Time)	9 Topic 9	Hydrogen production and utilization	Zoom: 961 9204 3941 Password:321083	https://www.koushare.com/lives/room/615647		余嘉怡 18851020505
	10 Topic 10	Low carbon technology and new energy	Zoom: 972 0383 7723 Password:908999	https://www.koushare.com/lives/room/550622		杨思怡 18846927795
	11	Interdisciplinary multiphase flow (medicine, bionic, ...)	Zoom: 967 4317 8876 Password:863301	https://www.koushare.com/lives/room/509967		李腾腾 18437058280
	12 Topic 1	Interfacial phenomena & mechanisms	Zoom: 996 8660 6051 Password:077329	https://www.koushare.com/lives/room/683327		王江 18468189134
	13 Topic 2	Multiphase flow and heat transfer	Zoom: 985 3576 2811 Password:235615	https://www.koushare.com/lives/room/417123		张凯妮 18292877341

	14 Topic 3	Reactive multiphase flow	Zoom: 963 0315 2024 Password:121450	https://www.koushare.com/lives/room/621158		杨佳琛 18729343523
	15 Topic 4	Modeling and numerical methodologies	Zoom: 923 3639 8625 Password:686314	https://www.koushare.com/lives/room/560359		林传捷 17600692455
	16 Topic 5	Measurement and instrumentation	Zoom: 928 8740 2267 Password:410419	https://www.koushare.com/lives/room/666520		穆雪芳 15326287520
July 29 14:30-18:00 (China Time)	17 Topic 6	Multiphase flow in industrial process	Zoom: 966 8421 1833 Password:400162	https://www.koushare.com/lives/room/885782		张凯妮 18292877341
	18 Topic 7	Resource exploitation (rare-earth, oil & gas)	Zoom: 926 4433 2505 Password:112779	https://www.koushare.com/lives/room/930964		杨佳琛 18729343523
	19 Topic 8	Organic waste conversion and utilization	Zoom: 921 2202 5292 Password:181715	https://www.koushare.com/lives/room/225067		林传捷 17600692455

	20 Topic 2	Multiphase Flow and Heat Transfer	Zoom: 978 4069 6368 Password:818015	https://www.koushare.com/lives/room/823415		穆雪芳 15326287520
	21 Topic 10	Low carbon technology and new energy	Zoom: 939 9402 0711 Password:990500	https://www.koushare.com/lives/room/141886		唐灿芳 18777448583
	22 Topic 8	Organic Waste Conversion and Utilization	Zoom: 945 0028 5480 Password:134565	https://www.koushare.com/lives/room/839639		刘裕凯 18810788712
	23 Topic 1	Interfacial phenomena & mechanisms	Zoom: 993 8040 2026 Password:666888	https://www.koushare.com/lives/room/155444		陈秉学 15022601890
	24 Topic 4	Modeling and Numerical Methodologies	Zoom: 922 2136 4884 Password:548192	https://www.koushare.com/lives/room/086146		任维熙 18729792665

Report Arrangement for July 30, 2022

Time	Session	Topic	Zoom Meeting ID (Room Password)	Koushare Meeting		Principal Telephone
July 30 8:40-11:50 (China Time)	25 Topic 2	Multiphase Flow and Heat Transfer	Zoom:926 7419 9671 Password:538676	https://www.koushare.com/lives/room/136297		余嘉怡 18851020505
	26 Topic 4	Modeling and Numerical Methodologies	Zoom:920 8107 2063 Password:557195	https://www.koushare.com/lives/room/570630		杨思怡 18846927795
	27 Topic 5&10	Measurement and instrumentation Low carbon technology and new energy	Zoom:955 8998 5562 Password:805170	https://www.koushare.com/lives/room/107854		李腾腾 18437058280
	28 Topic 1&2	Modeling and numerical methodologies Multiphase flow and heat transfer	Zoom:941 2567 2969 Password:348535	https://www.koushare.com/lives/room/706514		王江 18468189134
	29 Topic 2&5	Multiphase flow and heat transfer Measurement and instrumentation	Zoom:973 3903 9847 Password:729844	https://www.koushare.com/lives/room/347928		张凯妮 18292877341

	30 Topic 1	Interfacial phenomena & mechanisms	Zoom:998 7357 5422 Password:831477	https://www.koushare.com/lives/room/078242		杨佳琛 18729343523
	31 Topic 2	Multiphase flow and heat transfer	Zoom:962 9633 7861 Password:002551	https://www.koushare.com/lives/room/062436		林传捷 17600692455
	32 Topic 3	Reactive multiphase flow	Zoom:996 9971 0923 Password:996572	https://www.koushare.com/lives/room/924886		穆雪芳 15326287520
	33 Topic 4	Modeling and numerical methodologies	Zoom:923 8670 3053 Password:920280	https://www.koushare.com/lives/room/896856		唐灿芳 18777448583
	34 Topic 5	Measurement and instrumentation	Zoom:926 6359 0630 Password:223911	https://www.koushare.com/lives/room/889423		刘裕凯 18810788712
July 30 14:30-16:00 (China Time)	35 Topic 6	Multiphase flow in industrial process	Zoom:985 1447 2385 Password:666888	https://www.koushare.com/lives/room/043587		陈秉学 15022601890

	36 Topic 2	Multiphase flow and heat transfer	Zoom:926 1370 8760 Password:612157	https://www.koushare.com/lives/room/687413		任维熙 18729792665
	37 Topic 8	Organic waste conversion and utilization	Zoom:913 2628 4160 Password:438230	https://www.koushare.com/lives/room/550036		余嘉怡 18851020505
	38 Topic 2	Multiphase flow and heat transfer	Zoom:934 9305 2227 Password:605373	https://www.koushare.com/lives/room/097298		杨思怡 18846927795
	39 Topic 1	Interfacial phenomena & mechanisms	Zoom:937 5735 3181 Password:947238	https://www.koushare.com/lives/room/509052		李腾腾 18437058280
	40 Topic 1	Interfacial phenomena & mechanisms	Zoom:980 9901 1255 Password:399301	https://www.koushare.com/lives/room/120745		王江 18468189134
	41 Topic 4	Modeling and numerical methodologies	Zoom:941 7620 6349 Password:419711	https://www.koushare.com/lives/room/687274		张凯妮 18292877341

	42 Topic 6	Multiphase flow in industrial process	Zoom:971 3803 9909 Password:374533	https://www.koushare.com/lives/room/434237		杨佳琛 18729343523
	43 Topic 6	Multiphase flow in industrial process	Zoom:932 1201 1262 Password:925846	https://www.koushare.com/lives/room/442381		林传捷 17600692455
	44 Topic 6	Multiphase flow in industrial process	Zoom:997 3440 7990 Password:256005	https://www.koushare.com/lives/room/015061		穆雪芳 15326287520

Conference main page: https://www.koushare.com/topicIndex/i/MTCUE-2022

4. Inviter Profile

4.1 Plenary Lectures

Name	Affiliation	Country
Plenary Lectures		
Davide Del Col	University of Padova	Italy
Khellil Sefiane	University of Edinburgh	UK
Raffaella Ocone	Heriot-Watt University	UK
Yulong Ding	University of Birmingham	UK
Demetrios Papageorgiou	Imperial College London	UK
Gretar Tryggvason	Johns Hopkins University	USA
Gherhardt Ribatski	University of São Paulo	Brazil
Jinliang Xu	North China Electric Power University	China
Bofeng Bai	Xi’an Jiaotong University	China
Hui Jin	Xi’an Jiaotong University	China
Maochang Liu	Xi’an Jiaotong University	China

Plenary Lecture Speakers

Effect of Steam Velocity during Dropwise Condensation

Prof. Davide Del Col

University of Padova, Padua, Italy
davide.delcol@unipd.it

Davide Del Col is full professor at University of Padova (Italy), where he teaches "Refrigeration and heat pump technology" and "Renewable energy technologies". He is Coordinator of the Master degree in Energy engineering at University of Padua, Secretary of UIT (Italian Union of Thermofluid dynamics), Member of Scientific Council of ICHMT, Secretary of Commission B1 of IIR (International Institute of Refrigeration), Paris. He is the responsible of the research group "STET - Sustainable Thermal Energy Technologies", running the Lab of heat transfer with phase change, the Solar energy conversion lab and the Lab of refrigeration and heat pumps. At present he is the coordinator of the ESA Programme: Condensation in microgravity, 2019-2022, with partners from Europe and Canada. Scientific responsible for many international and national projects and projects funded by private companies, he is inventor of three patents (two of them granted to private companies). According to Scopus, he has 161 cited documents, with over 4600 citations and h-index=36.

Title: Effect of Steam Velocity during Dropwise Condensation

Boiling and Bubbles Dynamics from Artificial Nucleation Sites

Prof. Khellil Sefiane

School of Engineering,
University of Edinburgh, Edinburgh, UK
k.sefiane@ed.ac.uk

Professor Khellil Sefiane, PhD, HDR, FRSC and FInstP is a Professor and chair of Thermo-Physical Engineering in the School of Engineering at the University of Edinburgh, Scotland, United Kingdom. He is the Head of the research Institute for multiscale Thermofluids at the University of Edinburgh. Professor Sefiane is a vice President of the UK Heat Transfer Committee. He is the UK editor for the International Journal of Heat and Mass Transfer. He has been associate editor for the International Journal of Multiphase Flows and the ASME Journal of Heat Transfer. He held honorary appointments as Adjunct Professor at the University of Toronto, Canada (2008-2014), Visiting Professor at Kyushu University in Japan and World Premier International Professor at the International Centre for Carbon Neutral Energy Research (I2CNER) at Kyushu in Japan (2015-2019), Shanghai Jiao Tong University, China (2020) and Pretoria University, SA (2021). He is Fellow of the Royal Society of Chemistry, FRSC, and Fellow of the Institute of Physics, FInstP. Professor Sefiane has been research active for the last 25 years in various areas related to multiphase flows, heat transfer, microfluidics, interfacial phenomena and phase change. He has published more than a 250 journal papers in international journals. He has been recipient of the prestigious Institute of Physics (IoP) award (2009) for his work on droplets wetting and evaporation. He holds an ExxonMobil fellowship and Global Research Award, both awarded by the Royal Academy of Engineering, London. Professor Sefiane is member of numerous international scientific committees of experts in heat transfer and multiphase flows (ICHMT, EUROTHERM).

Title: Effect of Steam Velocity during Dropwise Condensation

From Fundamentals to Industrial Applications Opportunities and Challenges

Prof. Raffaella Ocone

Department of Chemical Engineering,
Heriot-Watt University, UK
R.Ocone@hw.ac.uk

Raffaella Ocone obtained her first degree in Chemical Engineering from the Università di Napoli, Italy and her MA and PhD in Chemical Engineering from Princeton University, USA. She holds the Chair of Chemical Engineering in the School of Engineering and Physical Sciences at Heriot-Watt University (HWU) since 1999. She is a Fellow of the Royal Academy of Engineering (RAEng), the Royal Society of Edinburgh (RSE), the Institution of Chemical Engineers (IChemE), and the Royal Society of Chemistry. In 2007 she was appointed Cavaliere (Knight) of the Order of the Star of Italian Solidarity by the President of the Italian Republic. In The Queen's 2019 New Year Honours she was appointed Officer of the British Empire (OBE) for services to engineering. Recently she has been announced as one of the top 100 Most Influential Women in the Engineering Sector. The list, produced by board appointments firm Inclusive Boards in partnership with the Financial Times, includes senior leaders from top engineering firms such as Amey, Arup, BAE Systems, and Laing O'Rourke. Raffaella has taken a leading role in debating the role that ethics plays in engineering and the future of energy supply and its relation to climate change. She has featured on a number of public events including a Panel discussing greenhouse gas removal and the associated technologies at the Global Grand Challenge Summit 2019 organized jointly by the Royal Academy of Engineering (RAEng), the Chinese Academy of Engineering (CAE), and the National Academy of Engineering (NAE). In October 2019, Raffaella also featured in a Panel organized by the RSE at the Festival of Politics at the Scottish Parliament debating whether efforts to improve public knowledge of female scientists are working and spoke at a Panel on "Scotland's Energy Future: No Easy Options". The Panel was held as a fringe event organised by the RSE at the SNP Congress in Aberdeen in October 2019. The panel addressed the key themes from the recent RSE inquiry into Scotland's Energy Future and debated how best Scottish energy policy can meet the competing challenges. At HWU, Raffaella is the Head of the Multiphase Multiscale Engineering Modelling (MMEM) research group. Raffaella has worked in a number of highly recognised international Institutions such as the Università di Napoli (Italy); Claude Bérnard Université, Lyon (France); Louisiana State University (USA); Princeton University (USA).

Title: From Fundamentals to Industrial Applications –Opportunities and Challenges

Abstract:

Conversion of biomass poses challenges at each stage of the production chain. Sustainability issues characterise not only the feedstock supply but also the end-use products. Technical challenges might hinder large scale economically viable conversion processes. The talk reviews the most common technologies for biomass conversion and explores some of the research which would be needed to deliver biofuels and chemicals in a sustainable and reliable manner. An example of current research in the area of pyrolysis is presented and its advantages and limitations are discussed.

Composite Phase Change Materials for Heating and Cooling Decarbonisation

Prof. Yulong Ding

School of Chemical Engineering,
University of Birmingham, Birmingham City, UK
y.ding@bham.ac.uk

Introduction: Professor Yulong Ding holds the founding Chamberlain Chair of Chemical Engineering and is the founding Director of University of Birmingham Centre for Energy Storage. He has research interests in energy materials and energy processes with a focus on understanding multiphase transport phenomena across length scales and using the fundamental understanding to develop novel electrical and thermal energy storage technologies. He has published over 450 technical papers with ~350 in peer-reviewed journals (GS H-Index~73) and filed over 70+ patents. He is an inventor of liquid air energy storage technology (commercialized by Highview Power, a UK engineering company). His work on composite phase change materials has led to large scale deployment with a total installation of 300+ MW / 1.2+ GWh for cleaning heating applications (Jinhe Energy). His work on passive cooling container technology for cold chain transportation has started commercial deployment (CRRC Shijiazhuang). Professor Ding's work has been recognised by the election to the fellow of Royal Academy of Engineering (2020); IChemE Clean Energy Medal (2021); IChemE Global Awards (2019) in three categories of Energy, Research Project and Outstanding Achievement; Cryogenic Energy Storage Research Chair Award (Royal Academy of Engineering, 2014), and Energy & Environment Award and Technology and Innovation Grand Prix Award (The Engineer, 2011). He currently serves on the Molten Salts Advisory Group of the UK Department for Business, Energy and Industrial Strategy, Royal Society Net Zero Panel, IChemE Publication Medal Assessment Panel, and European Technology, and Innovation Platform Working Group on Smart Networks for Energy Transition (ETIPSNET). He is an associate editor of Energy Storage and Saving (KeAi/Elsevier) and Discovery Energy (Springer Nature) and serves on the editorial boards of Journal of Energy Storage (Wiley), Journal of Thermal Science (Springer), and Particuology (Elsevier).

Title: Composite Phase Change Materials for Heating and Cooling Decarbonisation

Abstract:

Heating and cooling is regarded one of biggest challenges in energy system decarbonisation by middle of this century to achieve Net-Zero. Thermal energy

storage (TES) has a pivotal role to play in such net-zero energy systems. TES consists broadly of three categories of sensible, latent, and thermochemical storage technologies. This talk concerns with the latent-heat-based TES using composite phase change materials (cPCMs). Although the cPCM-based TES technology has been in commercial deployment, important scientific and technological challenges remain, including materials, components and devices, and integration of the devices within energy networks. This requires fundamental understanding of the underlying physics particularly flow and heat transfer of multiphase systema across a very large spatial length scale from atomic/molecular level to system level. The talk will focus on cPCM materials and devices, covering both heating and cooling applications.

Feedback and Optimal Control of Falling Film Flows

Prof. Demetrios Papageorgiou

Department of Applied Mathematics,
Imperial College London, London, UK
d.papageorgiou@imperial.ac.uk

Demetrios Papageorgiou is a Professor of Applied Mathematics at Imperial College London. His undergraduate and PhD degrees are in Mathematics (University College London and Imperial College London). Prior to joining Imperial College in 2008, he spent his academic career in the US at the Courant Institute of New York University, the Levich Institute of the City College of New York, and the New Jersey Institute of Technology where he was a Distinguished Professor. His research interests centre on physical applied mathematics and in particular theoretical and computational fluid mechanics including waves and interfacial flows incorporating effects such as surfactants, electric and magnetic fields, and viscoelasticity. He is a Fellow of the American Physical Society and a Fellow of the Institute of Mathematics and its Applications. He is co-Editor in Chief of the IMA Journal of Applied Mathematics and served as an Associate Editor for the SIAM Journal on Applied Mathematics. He has had a long association with ICASE, NASA Langely Research Center, where he was a joint recipient of the NASA Group Achievement Award as a member of the ICASE Fluid Mechanics Group. His research has been funded over the years by AFOSR, EPSRC, NASA and NSF.

Title: Feedback and Optimal Control of Falling Film Flows

Numerical Simulations of Complex Multiphase Flows

Prof. Gretar Tryggvason

Department of Mechanical Engineering,
Johns Hopkins University, Baltimore, USA
gtryggv1@jhu.edu

Gretar Tryggvason is the Charles A. Miller, Jr. Distinguished Professor at the Johns Hopkins University and the head of the Department of Mechanical Engineering. He received his PhD from Brown University in 1985 and was on the faculty of the University of Michigan in Ann Arbor until 2000, when he moved to Worcester Polytechnic Institute as the head of the Department of Mechanical Engineering. Between 2010 and 2017 he was the Viola D. Hank professor at the University of Notre Dame and the chair of the Department of Aerospace and Mechanical Engineering. Professor Tryggvason is well known for his contributions to computational fluid dynamics; particularly the development of methods for computations of multiphase flows and for pioneering direct numerical simulations of such flows. He served as the editor-in-chief of the Journal of Computational Physics 2002-2015, is a fellow of APS, ASME and AAAS, and the recipient of several awards, including the 2012 ASME Fluids Engineering Award and the 2019 ASTFE Award.

Title: Numerical Simulations of Complex Multiphase Flows

Liquid Film Characteristics during Horizontal Annular Flows for In-Tube Evaporation and Condensation

Prof. Gherhardt Ribatski

São Carlos School of Engineering,
University of São Paulo (USP), Brazil
ribatski@sc.usp.br

Dr. Gherhardt Ribatski is Full Professor of Multiphase Flow and Heat Transfer at the São Carlos School of Engineering, University of São Paulo (USP), Brazil. He received his BS, MSc. and Doctoral Degrees in Mechanical Engineering from the University of São Paulo. He held postdoctoral positions at the University of Illinois at Urbana– Champaign, Swiss Federal Institute of Technology in Lausanne (EPFL) and Universidade da Coruña. His research interests cover various areas of multiphase flows and heat transfer. Prof. Ribatski is member of the Congress Committee of International Union of Theoretical and Applied Mechanics (IUTAM) and Brazilian Delegate to the Assembly for International Heat Transfer Conferences. He is member of Assembly of World Conferences on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, Virtual Institute of Two-Phase Flow and Heat Transfer, Scientific Council of the International Centre for Heat and Mass Transfer (ICHMT). He was Director Secretary (2016-2017) and is member and President of the Brazilian Society of Mechanical Sciences and Engineering (2018-2021). He has served as coordinator of the CAPES (Coordination for the Improvement of Higher Education Personnel-Brazil) committee for evaluation of graduate programs in the areas of Mechanical, Mechatronics, Naval and Ocean, Aeronautical, Industrial and Petroleum Engineering. He is member of the area panel of Engineering of FAPESP (São Paulo Research Foundation – Brazil). Prof. Ribatski is subject editor of Applied Thermal Engineering, editor of Experimental Thermal and Fluid Sciences and member of the Editorial Advisory Board of International Journal of Multiphase Flow. He has presented 11 keynote lectures and taken part in the scientific committee of several International Conferences. Dr. Ribatski has over 100 refereed journal publications, 6 book chapters, 1 book and over 120 refereed papers in conferences.

Title: Liquid Film Characteristics during Horizontal Annular Flows for In-Tube Evaporation and Condensation

Pseudo-Phase Change Theory and Applications for Supercritical Fluids

Prof. Jinliang Xu

School of Energy Power and Mechanical Engineering
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Introduction: Dr Jinliang Xu is professor in School of Energy Power and Mechanical Engineering at North China Electric Power University, and has been the Director of Key Laboratory of Power Station Energy Transfer Conversion and System, China. He has over thirty years of experience in the field of multiphase flow and heat transfer. He has had visiting positions in Hongkong (China), USA, Singapore and UK. He led the National Key R&D Program of China and the National Basic Research Program of China for 10 years. Dr Jinliang Xu is active in the field of multiphase flow. He was the chair or co-chair for a set of academic conferences such as 4th Micro and Nano Flows Conference (University College London, UK, 2014), IHTS 2014 (International Heat Transfer Symposium 2014, Beijing) and first Int. Conference on supercritical CO2 power system (2018, Being) etc. He is the editor of the journals of Thermal Science and Engineering Progress, Frontiers in Heat pipe, Water, Energies. He is the guest editor for the special issues of Energy and Applied Thermal Engineering. He presented 40 plenary/keynote speeches in international conferences, and has been the reviewer for more than 40 journals. He was the best reviewer of the Journal of Heat Transfer, ASME in the fiscal year of 2012. As the corresponding author, he published more than 300 scientific papers and co-authored two books. Dr Jinliang Xu was named as the "Yangtze River Scholar" Professor by the National Ministry of Education, China in 2013. He received the Natural Science Award of the Ministry of Education, China (first grade), and the Distinguished Contribution Award from Chinese Society for Electrical Engineering (2021).

Title: Pseudo-Phase Change Theory and Applications for Supercritical Fluids

Abstract:

Supercritical fluids widely exist in nature and engineering facilities. Classically, supercritical fluid is treated as single-phase fluid without phase change and interface. Hence, theories to describe flow and transfer are different in subcritical pressure and supercritical pressure. In 1960s, scientists found that wall temperatures can have overshoot excursion when they studied the forced convection heat transfer in tubes using supercritical fluid of water. This phenomenon is similar to that takes place in subcritical pressure. Thus, the term of

"pseudo-boiling" was called to make a connection between the two domains of pressures, but the definition and content of pseudo-boiling has not been given until recently. In the past half century, engineers have been using the single-phase fluid theory to deal with fluid flow and heat transfer in supercritical pressure, introducing larger uncertainties when comparing with experiments. The design and operation of various heat exchangers operating in supercritical pressure rely on experiments, due to the lack of reliable theoretical predictions.

In this presentation, we summary the key points that have been investigating regarding the pseudo-phase change heat transfer in supercritical pressure conducted at North China Electric Power University, China. We abandoned the single-phase fluid assumption in supercritical pressure, but instead proposed the pseudo-phase change theory framework. In microscopic level, bubble-like and multi-phase feature of supercritical fluid are observed and analyzed, by using molecular dynamics simulation. A comprehensive measurement system was set up, integrating optical fibre, precise thermocouple detector and high-speed visualization. We found two modes of pseudo-phase change: pseudo-evaporation with evaporation at flat interface, and pseudo-boiling with periodic bubble-like nucleation, growth and collapse. On the basis of these observations, we proposed the three-regime model (liquid-like, two-phase-like and vapor-like). To characterize the three-regimes, the pseudo-phase change temperature, enthalpy, and vapor mass quality are established. A set of non-dimensional parameters were proposed to describe the interactions of mass, momentum and energy between liquid-like phase and vapor-like phase. Critical condition for the onset of heat transfer deterioration and heat transfer coefficients are developed using the pseudo-phase change theory. Significantly improved prediction accuracy has achieved compared with those using the single-phase fluid theory.

State Key Laboratory of Multiphase Flow in Power Engineering

Prof. Bofeng Bai

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Bofeng Bai received the B.Eng. degree in fluid machinery from Xi'an Jiaotong University (XJTU), China, in 1993 and the M.Sc. and Ph.D. degrees in Power Engineering & Engineering Thermophysics from XJTU in 1995 and 1999, respectively. He started his academic career as a Lecturer at XJTU in 1999 and worked as an Associate Professor from July 2002, Professor since August 2007, and Leading Professor since 2015. He served as director of the Department of Thermal Engineering at XJTU from October 2008 to July 2012. He serves as the Deputy Director of the State Key Laboratory of Multiphase Flow in Power Engineering (SKLMF) since September 2002. He leads the research group of Multiphase Flow Interface and Regulation (MFIR).

His primary research interests focus on multiphase flow measurement, complex flow and heat mass transfer. He has authored and co-authored more than 350 papers in journals and conference proceedings, including 160 papers published in international journals, such as J Fluid Mech. (4), Phys. Fluids (6), Int J Multiphase Flow (3), Phys. Rev. Fluids (1), Soft Matter (4), Chem. Eng. Sci. (23), Exp. Therm. Fluid Sci. (14), Appl. Therm. Eng. (10), Int J Heat Mass Transfer (8), AIAA J (4), Flow Meas. Instrum. (3), Meas. Sci. Technol.(1), Measurement (1), etc. He chaired and co-chaired 3 international academic conferences or symposiums and delivered 22 keynote speeches.

He was the recipient of several awards, including China National Ten Thousand Talent Program and China National Funds for Distinguished Young Scientists. He serves as the Secretary General of the Multiphase Flow Committee of China, and the Senior Member of Council of the Chinese Society of Engineering Thermophysics since 2009. Prof. Bai has been serving as the Associate Editor of Journal of Mechanical Engineering Science (Proc. IMech E Part C) since 2019, the member of editorial board of Case Studies in Thermal Engineering (Elsevier) and Interfacial Phenomena and Heat Transfer (Begell House).

Title: State Key Laboratory of Multiphase Flow in Power Engineering

Enhancement of multiphase reacting flow: coal gasification in supercritical water as an example

Prof. Hui Jin

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Hui Jin received Ph.D degree in Xi'an Jiaotong University in 2011. Full professor since 2018 in Xi'an Jiaotong University. He focuses on multiphase reacting flow, supercritical water gasification process and its large scale utilization. He is Manager of the NSFC Funding for Excellent Young Scholars, Director of new energy multiphase flow institute in Xi'an Jiaotong University, Board member of Chinese society for electrical engineering, Deputy leader of multiphase flow professional group in the Chinese Society of Theoretical and Applied Mechanics. He has more than 190 publications indexed by SCI and more than 5000 citations with an h-index of 40. 14 papers were indexed by ESI (3 hot papers). Awarded by the "Wu Chung-hua outstanding young scholar award" issued by Chinese Society of Engineering Thermophysics in 2022, Awarded by first prize in Science and Technology of Shaanxi province (ranking 3) In 2014. Associate editor of Energy Sources, Part A: Recovery, Utilization, and Environmental Effects. Editorial board member of Carbon Resources Conversion, Carbon Capture Science & Technology, Carbon Research, Biochar. Guest editor in Physics of fluids, ACS Sustainable Chemistry & Engineering, Physics of Fluids, Renewable Energy, Sustainable Energy Technologies and Assessments, International Journal Hydrogen Energy, Journal of Renewable Materials.

Title: Enhancement of multiphase reacting flow: coal gasification in supercritical water as an example

Abstract: Traditional coal utilization way has a series of disadvantages such as high pollution, high emission and high energy consumption. Supercritical water gasification technology, based on the concept of ordered energy conversion, provides a clean, low-carbon and efficient way of coal utilization owing to the unique physical and chemical properties of supercritical water. For technical

application, mild gasification temperature can effectively reduce investment and energy consumption, but it also causes lower reaction driving force. Therefore, the method of resistance analogy analyze was used in this paper to find reasonable regulation methods to achieve the optimal matching of heat transfer, mass transfer and chemical reaction, so as to realize comprehensive resistance reduction. The research was carried out from three aspects: the enhancement of main reaction, the inhibition of side reaction and the coordination of multiple reactions. Firstly, the rate-determining step of gasification process was found, and the method of liquid residual recycle was proposed to increase the free radical concentration at the reactor bottom to promote the gasification of polycyclic aromatic hydrocarbons. Then, based on the obtained drag, heat transfer and diffusion equations, the methods of controlling the nozzle heat flow boundary, adjusting the injection angle and designing the swirl distributor were proposed, which effectively restrain the side reaction in the nozzle and the reactor bottom. Finally, the heat match was conducted for the whole reactor based on the accurate kinetic model, which avoided overheating and reduced the heat transfer resistance. Based on the above optimization methods, a demonstration plant was constructed, where more than ten typical coals in China were completely gasified under mild temperature.

Multifield coupled concentrated-solar-driven catalytic water splitting for hydrogen production

Prof. Maochang Liu

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Maochang Liu is currently a full professor in International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, Xi’an Jiaotong University, China. He is also the Young Yangtze River Scholar, Ministry of Education, and holds the Top Young Talent program of Xi’an Jiaotong University. He received his Ph.D. degree in Power Engineering and Engineering Thermal Physics in 2014 from Xi’an Jiaotong University, Xi'an, China. From Sep. 2011 to Sep. 2013, he worked as a visiting scholar at Washington University in St. Louis and Georgia Institute of Technology with Prof. Younan Xia. Prof. Liu’s research interest centered on the fundamental theory of solar to hydrogen conversion with high efficiency and low cost, as well as the design and development of corresponding reaction systems. He has published more than 60 SCI papers in major international journals, including Nat. Energy, Nat. Commun., PNAS, JACS, Energy Environ. Sci.. He is currently a member of Committee on Hydrogen Energy of the Chinese Renewable Energy Society, the academic secretary of the Multi-phase Flow Branch of the Chinese Society of Engineering Thermology, serves as the guest editor or editorial board member of the Int. J. Hydrogen Energy, J. Photon. Energy, Prog. Energy Fuels and Energy Saving Technology. He has received a number of prestigious awards, including 1st Class Science and Technology Award of Shaanxi Province, 2nd Class National Natural and Science Award, and 1st Class Academic Paper in Natural Science of Shaanxi Province.

Title: Multifield coupled concentrated-solar-driven catalytic water splitting for hydrogen production

Abstract: Solar photocatalytic water splitting hydrogen production is an ideal solution for the future renewable energy supply system. Large-scale hydrogen production relies on the effective coupling of the catalyst particles and solar radiation in the multiphase reaction fluid. In our work, the coupling characteristics of solar concentrating radiation and reaction are regulated. The lens/attenuator group concentrating system is constructed to achieve the continuous modulation of light intensity and successfully coupled with the photocatalytic reaction process. To overcome the mass transfer limitation of water molecules in the catalytic material, a MOF support material with high water transport characteristics is developed to realize the efficient adsorption and desorption of water molecules on the surface of catalytic

materials, leading to efficient photothermal hydrogen production under concentrated light condition. For the interfacial bubble dynamics in the process of photothermal splitting water for hydrogen production, a PIV/PLIF method is developed to achieve accurate measurement of the flow and temperature fields around the bubbles. In addition, a magnetically coupled integrated concentrating photocatalytic hydrogen production system is proposed. Furthermore, a solar-photothermal coupled water-splitting hydrogen production system with Fresnel lens and composite parabolic concentrator was constructed. The above work may provide new ideas for the study of multifield coupled concentrated-solar-driven catalytic water splitting for hydrogen production.

4.2 Keynote speaker

Name	Affiliation, Country	Session
Keynote		
Lin Chen	Institute of Engineering Thermophysics, Chinese Academy of Sciences, China	1
Qiuya Tu	Chinese Academy of Sciences Institute of Engineering Thermophysics, China	2
Jinwen Shi	Xi'an Jiaotong University, China	3
MinXiang	National University of Defense Technology, China	4
Marco Jose da Silva	Federal University of Technology-Parana, Brazil	5
Shuang Cui	Engineering, University of Texas at Dallas, USA	6
Litao Zhu	Shanghai Jiao Tong University, China	7
Jianhang Hu	Kunming University of Science and Technology, China	8
Xiaonan Wang	Tsinghua University, China	9
Shuai Wang	Unversity of New South Wales, Australia	10
Zongyan Zhou	Jiangxi University of Science and Technology, China	11
Jing Li	Shanghai Jiaotong University, China	12
Sida Liu	Jiangxi University of Science and Technology, China	13
Chunyu Zhu	University of Texas at Dallas, USA	14
Hao Zhang	Northeastern University, China	15
Toshio Tagawa	Tokyo Metropolitan University, Japan	16
Pavel Skripov	Russian Academy of Sciences, Russia	17
Takuya Tsuji	Osaka University, Japan	18
Fei Xu	Ansys, Inc, USA	19
Libor Pekař	Tomas Bata University in Zlín, Czech Republic	20
Hua Sheng Wang	School of Engineering and Materials Science, UK	21
Yaning Zhang	Harbin Institute of Technology, China	22
Yanlin Zhao	China University of Petroleum - Beijing, China	23
Dongmin Yang	The University of Edinburgh, UK	24
Juancheng Yang	Xi'an Jiaotong University, China	25
Jia Zhu	Nanjing University, China	26
Yihang Li	Xidian University, China	27
Jianxin Xu	Kunming University of Science and Technology, China	28
Ben Xu	Mississippi State University, USA	29
Atsuki Komiya	Tohoku University, Japan	30
Hisashi Nakamura	Tohoku University, Japan	31

Sherman Cheung	RMIT University, Australia	32
Gherhardt Ribatski	University of São Paulo (USP), Brazi	33
Yi Li	Tsinghua University, China	34
Günter Brenn	Graz University of Technology, Austria	35
Yannis Hardalupas	UK	36
Lingxi Li	University College London, UK	37
Hongwei Wu	University of Hertfordshire, UK	38
Wuliang Yin	The University of Manchester, UK	39
Prashant Valluri	The University of Edinburgh, UK	40
Zhizhao Che	Tianjin University, China	40
Timothy Hunter	University of Leeds, UK	41
Guangtao Duan	The University of Tokyo, Japan	42
Dianyu E	Jiangxi University of Science and Technology, China	43
Shibo Kuang	Monash University, Australia	44

Introduction to Keynote Speakers

Selected

(Sort alphabetically)

Keynote: Professor Atsuki Komiya

Institute of Fluid Science
Tohoku University

Professor Atsuki Komiya is head of Heat Transfer Control Laboratory in the Institute of Fluid Science, Tohoku University, Japan. He received the PhD in mechanical engineering in Tohoku University in 2002. From 2002 to 2004, he was a Research Fellow with the Japan Aerospace Exploration Agency (JAXA). He worked the development of the facility of fluid experiment for space experiment. In 2004, he moved to the Tohoku University as an Assistant Professor. Since 2019, he has been a Professor of Tohoku University. He is the author of two books, more than 140 refereed papers and more than 2000 citations. Professor Komiya's awards and honors include the Young Researcher Award and Scientific Contribution Award of the Heat Transfer Society of Japan, and the Young Scientists' Prize of the Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology.

Title: Edge formation of small droplet on a substrate – Nano-scale visualization of precursor film dynamics

Abstract:

Phase-shifting ellipsometer, which can precisely visualize two-dimensional thin film thickness at the edge of small droplet has been developed in our laboratory. Experimental investigation in the vicinity of boundary area of three phases, solid-liquid-gas interface namely "contact line" is important for understanding of the phase change phenomena, such as boiling, condensation, and surface events such as wetting and drying phenomena. Theoretically, de Gennes has proposed a formula for a thickness of precursor film under the assumption that the wetting process obeys a viscous flow driven by disjoining pressure. This theoretical approach shows a formation of precursor film, however it is difficult to achieve precise measurement of nanoscale thickness of the film. In this study, we have developed a visualization system for the measurement of two-dimensional thickness distribution of the precursor film by using a phase-shifting technique. The proposed system could measure the transient thickness distribution. At the initial stage of droplet formation, the thickness of the edge region got thicker compared with that of inner region.

However, its thickness difference decreases with the droplet spreading. From the visualization results of two-dimensional image, the relation between circumferential shape of precursor film and surrounding condition was also discussed.

Keynote： Professor Ben Xu

Department of Mechanical Engineering
Mississippi State University

Prof. Ben Xu received his PhD from University of Arizona in 2015, he then stayed at Drexel University for one-year as a postdoctoral research associate. From 2016 to 2020, Prof. Ben Xu started his tenure-track Assistant Professor at University of Texas Rio Grande Valley. Since Fall 2020, Prof. Ben Xu joined the Department of Mechanical Engineering at Mississippi State University. Prof. Xu's research focuses on multiphase flow and heat transfer, additive manufacturing and laser-assisted bioprinting. Prof. Xu has published more than 50 peer reviewed papers, and he has received more than $1 million research fund from US DOE, NSF, NASA. Prof. Xu is the Chair of Renewable Energy and Energy Conversion technical committee in ASME Advanced Energy System Division, and he is the technical program co-chair of ASME Energy Sustainability Conference 2022.

Title： Multiphase Heat Transfer and Additive Manufacturing in High Temperature Concentrated Solar Power (CSP) Systems

Abstract：

In this presentation, Prof. Ben Xu will discuss three major components in a concentrated solar power system, and they are thermal storage system, solar receiver, and heat rejection system. The multiphase heat transfer in thermal storage system and heat rejection system will be discussed from numerical simulation perspective, and the discussion about solar receiver will mainly focus on the additive manufacturing of novel nickel-based super-alloy for high temperature and high corrosion application. At the end, Prof. Xu will list out some future research topics in Gen3 CSP system.

Keynote： Professor Chunyu Zhu

School of Low-carbon Energy and Power Engineering
China University of Mining and Technology

Chunyu Zhu received his Ph.D degree in Hokkaido University (Japan) in 2012. Then he received the support from JSPS fellowship (2012-2014) and received the assistant professor position (2016-2019) in Hokkaido University. He was a full professor since 2019 in China University of Mining and Technology. He focuses on the research of energy storage, including the thermal energy storage, electrochemical energy storage and hydrogen storage. He is now the head of the department of Energy Storage Science and Engineering in China University of Mining and Technology. He has more than 100 publications indexed by SCI and more than 3000 citations, among which more than 50 papers were published as the first/corresponding author.

Title： Al-based metallic macrocapsule for high temperature phase change thermal storage

Abstract：

Metallic phase change materials (PCMs) has advantages of high heat storage density, high thermal conductivity. This study reports a novel encapsulation method to achieve Al-based macrocapsules with good leakage prevention and high cyclability up to 500 cycles even under air atmosphere. Voids are artfully introduced inside the macrocapsules, which can accommodate large volume expansion of Al PCM during melting. For the Al@Al_2O_3 macrocapsules, the latent heat of Al core reaches 357.4 J/g.

Keynote： Associate Professor Dianyu E

Jiangxi Provincial Key Laboratory for Simulation and Modelling of Particulate Systems
Jiangxi University of Science and Technology (Nanchang)

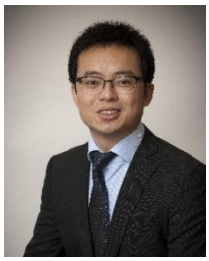
Dr Dianyu E is an Associate Professor in the International Institute for Innovation of Jiangxi University of Science and Technology of China. He was awarded a PhD in 2018 at Monash University Australia. His research has focused on the applications to a range of complex reactive flow processes in traditional and emerging industries particularly resource and energy sectors, including process metallurgy, biology processes, and renewable energy processes. His research interests range from understanding fundamentals to optimizing and developing new, cleaner and more efficient technologies, powered by advanced multidimension and multiscale modelling techniques, data-driven (AI) models and experimental approaches.

Title： Particle-scale modelling of injected hydrogen and coke co-combustion in the raceway of an ironmaking blast furnace

Abstract：

Hydrogen is environmental-friendly fuel without greenhouse gas (GHG) emissions and its applications have attracted significant attentions from many industries especially for ironmaking industry with massive fossil energy consumption. The injection of hydrogen into blast furnace (BF) is one of the most promising low-carbon ironmaking routines. In this study, an experimentally validated CFD-DEM model is adopted to investigate dynamics, microstructure and thermochemical behaviours in the raceway of BF with hydrogen injection operation (HIO), which include raceway evolution, force distribution and the co-combustion characteristics of hydrogen and coke. Some significant features have been captured through comparison analyses between HIO and AIO (air injection operation). Especially, the effects of hydrogen injection concentration on raceway size, gas temperature and component are studied. The simulation results show that a smaller raceway is formed under HIO in comparison with AIO. In addition, the gas temperature is higher near tuyere but lower along the tuyere axis, and the oxygen consumption is larger and produces more CO. As hydrogen injection concentration increases: i) the raceway size and gas temperature decreases; ii) the CO generates at the early stage and the maximum CO2 concentration moves to inlet direction along tuyere axis. The results shed light on the fundamental understanding of low-carbon ironmaking BF technology.

Keynote： Dr Dongmin Yang



School of Engineering
University of Edinburgh

Dr Dongmin Yang is a Senior Lecturer in Composite Materials at the University of Edinburgh. His current research interests focus on Composites Engineering (materials, manufacturing and structures) and Computational Engineering (multiscale, multiphysics, multiphase coupling). With a background in manufacturing and later experience in structural and materials engineering, his cross-disciplinary research is at the interfaces of underpinning material science, emerging manufacturing technologies and advanced structural analysis and design. He also develops computational techniques and deterministic models to address multiscale, multiphysics and multiphase coupling challenges across engineering disciplines.

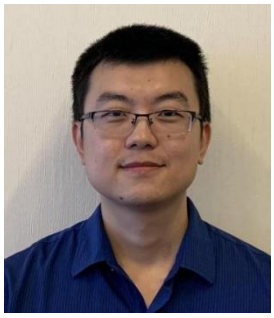
Title： Fibre flow in 3D printing of discontinuous fibre reinforced thermoplastic composites

Abstract：

X-ray micro-tomography (μCT) scans and a coupled multiphase model based on computational fluid dynamics (CFD) and discrete element method (DEM) are used to investigate the fibre flow inside the printer nozzle during 3D printing of short fibre reinforced thermoplastic composites by fused filament fabrication (FFF). Short carbon fibre T300 reinforced nylon-6 composite is selected as the printing material. X-ray CT is performed on the raw filament, in-nozzle melted filament, extruded printing bead and on-bed printing bead to trace the through-process evolution of fibres and voids for the specific nozzle used therein. Qualitative visualisation of voids fraction and fibre orientation, length and fraction, as well as quantitative analysis are carried out using image processing techniques. The results show that the orientation and volume fraction of fibres vary with different internal geometry of the nozzle and fibre misalignment occurs in the on-bed printing bead because of the relative motion between the nozzle and the print bed disturbs the flow field. Also, the fibre length decreases slightly during the printing process due to the collision between fibre and nozzle wall when the melted materials pass the nozzle. Most voids are generated when the melted filament is extruded from the nozzle, and porosity decreases in the on-bed printing bead. In addition, a coupled CFD-DEM is developed, in which the collisions between fibres are considered naturally in DEM by using the Hertz-Mindlin contact law. Once validated against X-ray microtomography (uCT) experimental results, a parametric study is performed using the CFD-DEM model to investigate various fibre lengths, fibre volume fraction and resin viscosity. It shows that the nozzle clogging tends to occur when the fibre length and/or the fibre volume fraction are increased. The use of a polymer matrix with lower viscosity can be effective to

eliminate the clogging issue when printing composites with relatively short fibres. The fibre length is dominating when long fibres are used and the clogging is largely independent of the viscosity of the polymer matrix. Finally, a potential solution of using a cone sleeve insert located above the shrinking region to address the nozzle clogging issue is proposed and numerically assessed.

Keynote： Dr. Fei Xu



Ansys Inc.

Fei Xu received his Ph.D in Mechanical Engineering from Iowa State University (2018). He then joined Ansys as a research and development engineer focused on developing software package for industry-scale thermo-fluid problems. His research interests include multiphase flows & reactions, heat transfer, fluid-structure interaction, and their applications in various complex industrial scenarios. In these areas, he has published 37 peer reviewed papers in international journals, 19 out of which are first/corresponding authored by him. In addition, Dr. Xu was invited to guest edit three special issues held by Renew. Energy., Chem. Eng. Process., and Comput. Math. with Appl., covering topics from biomass thermal conversions to developments of open-source software. He was invited to review research proposals for the Research Grant Council of Hong Kong, and to serve on panelist for the National Science Foundation of US.

Title： Modeling the multi-phase flow problems in fluid-structure interaction systems.

Abstract：

Fluid-structure interaction systems are ubiquitous in energy related engineering problems. Among them, the flow subproblems are often multi-phase. In this study, a variational multiscale framework is presented, with an emphasis on modeling the multi-phase flow in such systems. We start from a finite element variational multiscale (VMS) formulation for incompressible turbulent flows. The multi-phase flow is modeled by a level-set scalar convection system, which is enhanced by a re-distancing technique and mass balance operator. A simple but effective and generalized moving contact line model is proposed. To account for the ill-conditioned system matrix originated from the multi-scale nature of the problem, a direct coupling approach based on a matrix-free technique is developed. The framework is further augmented by an immersogeometric method to model complex geometries and large-scale structural displacements. The simulation results demonstrate good agreements between the numerical framework and experimental measurements in engineering applications, such as off-shore wind turbines and marine engineering problems.

Keynote： Assistant Professor Guangtao Duan

Department of Nuclear Engineering and Management
School of Engineering, The University of Tokyo

Guangtao Duan received his PhD degree in Xi'an Jiaotong University in 2016. He became a junior researcher since 2018 in Waseda University and an assistant professor since 2020 in the University of Tokyo. His research focuses on the accuracy and stability improvement of the Lagrangian particle methods and the thermal-multiphase-flow application of numerical methods in various engineering fields. He is a member of the Computational Science and Engineering Division, Atomic Engineering Society of Japan. He has more than 30 peer-reviewed international journal papers in CMAME, JCP, IJNME, and so on. His papers have more than 500 citations. He has received "Excellent Paper Award" by Chinese Society of Theoretical and Applied Mechanics in 2014, "Best Paper Award" in 6th International Conference on Computational Method in 2015, "Best Paper Award" in 12th International Topical Meeting on Nuclear Reactor Thermal-Hydraulics, Operation and Safety (NUTHOS-12) in 2018, "Best Doctoral Thesis Award" from Xi'an Jiaotong University in 2019, and "AESJ CSED Young Researcher Award" from Atomic Energy Society of Japan in 2020.

Title： Stability and accuracy enhancement of Lagrangian particle methods for droplet flows

Abstract：

Particle methods have great potential for simulating multiphase flows with free surfaces. However, the lack of accuracy and stability is a key challenging problem for the conventional particle methods. The least squares method can be used to greatly enhance the accuracy of particle methods but easily trigger instability at the free surfaces. In this talk, two important strategies will be presented to guarantee the stability of the high-order particle method based on least squares. First, a novel free-surface detection approach is proposed to solve the instability at the free surfaces based on the stability analysis. Specifically, a theoretical and numerical analysis for the error accumulation due to the biased neighbor support is performed to clarify how the error accumulates over time and triggers instability. Second, a new particle shifting technique at free surfaces is proposed based on the surface reconstruction from curve fitting. The technique can greatly reduce the fluctuations of the detected free-surface boundaries and further enhance the accuracy and stability of simulations. After these two strategies are adopted, the reliability of droplet flow simulations is remarkably improved. Compared to conventional mesh methods, the new particle method can greatly save computational cost. As solutions for the bottleneck problems, these proposed techniques are expected to pave good way for the industrial applications of particle methods.

Keynote： Professor Dr.-Ing. habil. Günter Brenn

Institute of Fluid Mechanics and Heat Transfer
Graz University of Technology, Graz, Austria

Dr. Günter Brenn received his Aerospace Engineering degree from the University of Stuttgart in Germany in 1985. He received his Ph.D. from the same university in 1990. His doctoral research on drop shape oscillations was supervised by Professor A. Frohn (Institute of Aerospace Thermodynamics, University of Stuttgart, Germany).After a two-year post-doctoral stay in Japan, he joined Professor F. Durst's Chair of Fluid Mechanics (LSTM) at the University of Erlangen-Nürnberg (Germany) in 1992. Here, Dr. Brenn completed his habilitation in fluid mechanics in 1999.In 2002, he took his present full professor position at the University of Technology in Graz, Austria. He teaches fluid mechanics, heat and mass transfer. His research interests are spray flows, the rheology and rheometry of complex liquids, heat and mass transfer in disperse systems, the stability of free-surface flows, and optical flow measuring techniques. He published more than 130 peer-reviewed papers in scientific journals, the monograph "Analytical Solutions for Transport Processes" (Springer, 2017), and more than 160 contributions to scientific conferences. He is the European Editor-in-Chief of the journal *Atomization and Sprays* and a member of the editorial advisory board of *Experiments in Fluids*.

Title： Self-similar pressure-atomized sprays with heat and mass transfer

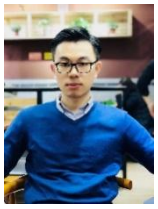
Abstract：

Sprays are produced by atomization of a liquid in an ambient gaseous medium. The properties of the two-phase flow fields of sprays cannot be described in a universal manner for all kinds of sprays. Axisymmetric free spray flow fields, however, exhibit self-similar properties, so that they can be described in an elegant way using the concept of self-similarity. This applies to air-assisted atomization as well as to pressure-atomized Diesel sprays and sprays from liquid-liquid coaxial swirl atomizers.

The present keynote lecture develops the self-similar equations of motion of disperse two-phase flow fields and applies them to pressure-atomized free sprays. Parameters in the self-similar equations are obtained from detailed phase-Doppler experiments, varying the Weber and Ohnesorge numbers of the nozzle flows independently. The experiments for use with self-similar spray characterisation must ensure high statistical reliability of the drop data, even at the edges of the spectra of drop properties. The experiments show that both the liquid drop and the gas flow fields of pressure-atomized sprays may be self-similar.

The work published earlier by the present authors is advanced by modeling heat and mass transfer between the drops and the gas based on the self-similar spray description, thus accounting for spray evaporation. Both the gas-phase temperature and the concentration of the vapour phase are determined by well-known transport equations in their self-similar forms. The self-similar transform of the effect of drop evaporation is compared against results obtained using the Frössling correlation for the Sherwood number. A modified drag law for single droplets is proposed for providing the drop velocity relative to the gas phase. The vapour concentration at the drop surface is obtained from a droplet vaporization model based on a mass and energy balance of a moving droplet in a non-saturated atmosphere. The vapour concentration determined from the self-similar analysis and the respective mass source remain to be validated against experiments or results from numerical simulations.

Keynote： Associate Professor Hao Zhang



School of Metallurgy
Northeastern University, China

Dr Hao Zhang obtained his Ph.D at Technical University of Catalonia and is now an Associate Professor at Northeastern University, China. His research interests currently focus on the computational particle technology mainly in four fields: (1) Process metallurgy; (2) Air pollution controlling and environmental protection; (3) Efficient and quality conversion of renewable energy and (4) Drying technology. He has had profound experience of using various particle-based numerical schemes on >10 projects. He has acquired 21 authorized invention patents, published 70 high quality papers in total (>1900 citations and H index is 21 based on Google scholar) and most of them are high quality papers in reputable international journals including 3 ESI highly cited papers. In recent years, he has also been awarded with various significant research grants including the projects financially supported by the National Key R&D Program of China and National Natural Science Foundation of China.

Title： Theoretical, Experimental and Numerical Investigations on Movement and Heat Transfer Mechanisms of Non-spherical Particles in Blast Furnace Raceway

Abstract：

Investigations of experimental and numerical are conducted to explore the changing laws of blast furnace (BF) raceway morphology and pressure drop. A theoretical correlation about raceway size is established containing the particle shape influence. Experimental data show that there are five typical stages for the pressure drop during the raceway formation. The closer the aspect ratio (Ar) of particle to 1, the bigger the raceway size and the wider the particle moving band will be. When the raceway is in stable stage, the pressure drop can be ascribed to the cooperative action of the bed height, inlet gas velocity and Ar. Numerical results reveal that the formation of large raceway for sphere-like particle is due to the small drag and contact forces in this system. The contact forces in the prolate particle system are very large and thus result in a small raceway. Finally, the influence of particle shape is employed to improve a raceway size predictive correlation which can increase the average calculational accuracy by 3.4%.

Keynote： Associate Professor Hisashi Nakamura

Institute of Fluid Science
Tohoku University

Hisashi Nakamura received his PhD degree in Engineering from Tohoku University in 2006. He became an Assistant Professor of Institute of Fluid Science, Tohoku University in 2007 and was promoted to an Associate Professor in 2015. He was a Visiting Researcher of Combustion Chemistry Centre, National University of Ireland, Galway for one year from Sep. 2011. His research interest includes combustion in the areas of laminar flames and chemical kinetics for hydrocarbons, low-carbon fuels, and battery electrolytes. He has published more than 70 refereed journal papers. The citation of his papers is more than 1500 and his h-index is 24 from Web of Science.

Title： Reaction zone separation by a micro flow reactor with a controlled temperature profile for validation of chemical reaction models of hydrocarbons, ammonia, refrigerants, and battery electrolytes.

Abstract：

To reduce emissions from combustion devices and fire accidents in energy systems, fundamental understandings on chemical kinetics and reliable chemical reaction models are essential. Because of the nature of reaction zone separation by a micro flow reactor with a controlled temperature profile (MFR), multi-stage reactions have been identified for various reactants with visualization and species measurements. Direct photography with long exposure time or laser induced fluorescence was used for visualization. Gas chromatography (GC), mass spectrometry (MS), GC-MS, or Fourier-transform infrared spectroscopy was used for species measurements. This presentation introduces various types of multi-stage reactions observed in MFR such as cool flame + blue flame + hot flame, pyrolysis + blue flame + hot flame, two-staged cool flames, oxidation + PAH growth + soot formation, ammonia oxidation + NO formation, NO-NO2 loop effects on blue flame, HF formation + CO oxidation + H2O decomposition, and HF formation + C2F6 decomposition + CO oxidation. The presentation also introduces effectiveness of multi-stage reactions for development and validation of chemical reaction models of these reactants.

Keynote： Associate Professor Hongwei Wu

School of Physics, Engineering and Computer Science
University of Hertfordshire, United Kingdom

Dr Hongwei Wu is an Associate Professor in the School of Physics, Engineering and Computer Science, and Leader of the Research Group in Monitoring Climate and its Impact (MCI) – C3R at University of Hertfordshire (UH). Hongwei is a Chartered Engineer (CEng), a Fellow of the Institution of Mechanical Engineers (FIMechE), a Fellow of the Energy Institute (FEI), and a Fellow of The Higher Education Academy (FHEA). He received his PhD degree (Joint PhD Programme with the Hong Kong University of Science and Technology) in Thermofluids from Beihang University in 2004. Hongwei's research mainly focuses on Advanced Cooling Technology, Energy Conversion and Storage Technologies, Renewable Energy and Energy System, Battery Thermal Management System (BTMS), Two Phase and Multiphase Flow, Fluid-Solid Conjugate Heat Transfer, Modelling/Simulation methods (CFD)-DNS, LES, MDS, Optimisation and Process Control, AI-Machine Learning (ML)-Deep Neural Networks (DNNs). He has published more than 150 papers with over 100 peer-reviewed journal publications including top journals such as Applied Energy, Applied Thermal Engineering, International Journal of Heat and Mass Transfer, Journal of Power Sources, etc. He has been a regular reviewer of many leading journals and serves as Editor/Editorial Board Members of many International Journals. He also serves as general Chair/co-Chair and session Chairs/co-Chairs, OCM and TPC members at many International Conferences.

Title： Energy-saving opportunities through advanced control of continuous frying systems

Abstract：

In an era of steadily increasing energy prices and concerns over the environmental impacts of energy use, energy efficiency can offer one of the best approaches to reduce greenhouse of the best approaches to reduce greenhouse gas emissions and improve profitability. In the production of potato crisps, frying consumes more than 90% of the total processing energy requirement so the greatest potential for energy savings is offered by design and control optimization to reduce thermal losses. Optimisation of the frying process requires good knowledge and understanding of the heat and mass transfer processes involved and their influence on product quality, safety, product throughput and energy consumption.

Keynote: Professor Jia Zhu

College of Engineering and Applied Sciences
Nanjing University

Dr. Jia Zhu is a Professor at College of Engineering and Applied Sciences, Nanjing University. His scientific research interest is in the area of nanophotonics and nanoscale heat transfer. Dr. Zhu obtained his bachelor in Physics at Nanjing University, received his M.S. and Ph.D. in Electrical Engineering from Stanford University. He worked as a postdoctoral fellow at University of California, Berkeley and Lawrence Berkeley National Lab. He has received several prestigious awards including: Explorer Prize (2020), NSFC Young Investigator Award (2019), Tan Kah Kee Young Scientist Award (2018), OSA Young Investigator Award (2017), Dupont Young Professor Award (2016), MIT Tech Review TR35 award (2016). He has published over 100 papers in prestigious journals (Nature, Nature series, National Science Review, Science Advances, Joule, PNAS etc.). He has delivered over 50 keynote/invited talks at leading research institutions and international conferences. He is a fellow of Optical (OSA), Royal Society of Chemistry, and serves as a managing editor of Nanophotonics, editorial board members of Advanced Photonics and Nano Research.

Title: Manipulating the flow of light & heat at nanoscale

Abstract:

Light and heat are the two most common and widely used energy in the society. Nanostructures with carefully tailored properties can be used to manipulate the flow of light and heat, to enable novel devices and functionalities in an unconventional manner. In this talk, I will present three examples.

The first example is about water. Water scarcity is one of the most pressing global challenges. I will present our recent progress in interfacial solar vapor generation and its related applications. We report that efficient and broad-band plasmonic absorber can be fabricated through a three dimensional self-assembly process. Inspired by the transpiration process in plants, we further report an artificial transpiration device with a unique design of two dimensional water path. The energy transfer efficiency of this artificial transpiration device is independent of water quantity, a signature of interfacial solar evaporation. At the end, we would like to demonstrate that this type of interfacial solar vapor generations can have direct implications in various fields such as solar desalination, zero liquid discharge, sterilization and power generations.

The second example is about passive cooling. Radiative cooling which sends heat to space through atmospheric transparency window without any energy consumption, is attracting significant attention. For radiative cooling to achieve high cooling performance, it is ideal to have a selective emitter, with an emissivity dominant in the atmospheric transparency window. However, so far scalable production of radiative cooling materials with selective emissivity has not been realized. Here I will present a hierarchical design for a selective thermal emitter to achieve high performing all-day radiative cooling. Moreover, it is revealed that this hierarchically designed selective thermal emitter shows significant advantage if being applied to alleviate Global Warming or to regulate temperature of the Earth-like planet.

The third example is about integrated photonics. Plasmonics combining the advantages of the speed of light and the size of electron, has long been pursued as promising candidates for integrated photonics. However, the loss of plasmonic materials has long been the primary road blocker for its widespread implementations. Here I report the first experimental demonstration of alkali metal as high performing plasmonic materials. Because of low loss property, a room temperature sodium based plasmonic nanolaser with a record low threshold is demonstrated. In addition, as alkali metal also possesses unique electrochemical properties, alkali metal plasmonics at the intersect of plasmonics and electrochemistry, open up tremendous opportunities for both information and energy storage.

Keynote： Professor Jianhang Hu

Professor, Doctor Supervisor. Kunming University of Science and Technology, China

Young and middle-aged academic and technical leaders in Yunnan. Visiting scholar at University of Sydney in Australia. My research area includes resource utilization of solid waste, low carbon metallurgical technology and conversion and utilization of biomass energy. Part-time Academic Job: Member of China Society of power engineering, Secretary General of University Teaching Steering Committee of energy and power major in Yunnan Province.

Title： Flow regimes in the transport zone of large-scale CFB combustor

Abstract：

Circulating fluidized beds (CFB) combustion technology is one of the major approaches to utilize solid waste fuel, and large-scale CFB combustors burning organic waste have been widely reported. However, the flow regimes in the large-scale CFB combustors remain unclear. In the bottom dense bed, the flow regime is often considered as a bubbling fluidized bed, though there are also opinions suggesting the flow regime in the dense bed is a turbulent fluidized bed. In the transport zone, the debates and researches about the flow regime have raised a lot of attention in recent years, between fast fluidization hypothesis and single-particle elutriation hypothesis. To further investigate the flow regime in the transport zone in the large-scale CFB combustors, filed tests were performed in a large-scale CFB boiler. The solid circulating rates were calculated based on the pressure drops in the transport zone and then compared with the estimations by using the correlations of both elutriation constant in the single-particle elutriation theory and saturation-carrying capacity in the fast fluidization theory. The effect of riser diameter on the circulating rate was discussed based on the existing experimental studies carried out in large-scale CFB boilers. The research found that it is insufficient to define the flow regime in the transport zone of large-scale CFB boilers based on the existing knowledge; however, it is reasonable to use the correlation of the elutriation constant proposed by Colakyan & Levenspiel for modeling because of its wide experimental conditions in terms of fluidization velocity, circulating rate and the riser diameter.

Keynote： Professor Jianxin Xu

Kunming University of Science and Technology

Jianxin Xu: Professor, doctoral supervisor, deputy director of Yunnan Province Industrial Energy Saving Engineering Laboratory, chief scientist of the cross research team of Mathematics and intelligent Energy of Yunnan Province Applied Mathematics Center, will be engaged in the research of nonlinear strengthening of metallurgical furnace thermal process, number intellectualization of metallurgical process, etc. From July 2017 to June 2018, he was appointed by China Scholarship Council to be a visiting scholar in School of Mathematics, University of Manchester, UK. Young and middle-aged academic and technical leaders in yunnan province, yunnan province, young talent of high-level personnel training support plan, attains the introduction of high-level personnel in yunnan province government housing subsidies and work funded, the first metallurgy outstanding young entrants, support plan of the Chinese chemical society mixing and stirring, deputy director of professional committee members, multiphase flow at the Chinese Academy of Engineering thermal physics branch committee member, Member of thermal Properties Special Committee of China Metrology and Testing Society, member of Energy Conservation and Emission Reduction Special Committee of China Non-ferrous Metal Society, member of Expert Committee of Technology Innovation Strategic Alliance of China Non-ferrous Metal Industry.

In recent years, he has presided over 3 national projects, 1 provincial key special project, more than 30 provincial and enterprise projects, and 1 curriculum ideological and political education reform project. Published more than 100 core papers; He has published 3 monographs, including 1 chapter in English. It has 24 authorized invention patents, 13 utility models and 2 soft publications. It won the first prize of Natural Science of Yunnan Province in 2021, the first prize of Technology invention of China Nonferrous Metal Industry in 2020, the second prize of the First Metallurgical Outstanding Youth Support Program in 2021, and the Special Prize of Science and Technology Progress of Yunnan Province in 2018. In 2017, he won the first prize of Science and Technology Progress of China Nonferrous Metal Industry, in 2015, he won the first prize of Technology Invention of China Nonferrous Metal Industry, in 2014, he won the second prize of Books of China Nonferrous Metal Publications Award, and in 2014, he won the Excellent Exhibition of Yunnan Province. In 2021, he won the silver Prize of the 7th China International "Internet plus" College Students Innovation and Entrepreneurship Competition, and the bronze prize of the first National Postdoctoral Innovation and Entrepreneurship Competition in 2021.

Title： Evolution and quantification of distribution uniformity of bubbles using computational geometry

Keynote： Associate Professor Jing Li

China-UK Low Carbon College
Shanghai Jiao Tong University

Dr. Li Jing received her Ph.D degree in Mechanical Engineering from City University of Hong Kong in 2018, after which she worked as a postdoc researcher in University of Pennsylvania. Since December 2021, she has joined China-UK Low Carbon College, Shanghai Jiao Tong University as an Associate Professor. Dr. Li's research is to develop multidimensional materials with tailored interfacial properties, and explore how the triple-phase interfacial interactions coupled with multiple physical fields promote the dynamics of droplets for efficient energy harvesting and green transport. She has published many papers in leading journals, including Nature Physics, Nature Communications, Advanced Materials and so on. She has also received many prestigious awards, such as Materials Research Society (MRS) Graduate Student Gold Award (2016, Fall), Hiwin Doctoral Dissertation Silver Award (2019), Hong Kong Young Scientist Award (2020) and so on.

Title： Aerodynamics-assisted, efficient and scalable kirigami fog collectors

Abstract：

Water shortage not only occurs in arid regions, but also in humid regions with little precipitation despite an abundance of suspended tiny fog droplets in environments. Gravity-assisted mesh structures have been implemented to harvest fog droplets. However, their efficiency is low due to the aerodynamic drag of fog-laden wind deflected around the mesh wires. Strategies such as the introduction of asymmetric structure shapes, optimization of surface roughness/chemistry and impregnation of lubricants can increase collection efficiency by promoting droplet-substrate (interfacial) interactions. But their fabrication is complex and the resulting structures are often fragile and not scalable for outdoor settings. Here, we show that the three-dimensional and centimetric kirigami structures can control the wind flow, forming quasi-stable counter- rotating vortices. The vortices regulate the trajectories of incoming fog clusters and eject extensive droplets to the substrate. As the characteristic structural length is increased to the size of vortices, we greatly reduce the dependence of fog collection on the structural delicacy. Together with gravity-directed gathering by the folds, the kirigami fog collector yields a collection efficiency of 16.1% at a low wind speed of 0.8 m/s and is robust against surface characteristics. The collection efficiency is maintained even on a 1 m2 collector in an outdoor setting.

Keynote： Associate Professor Jinwen Shi

State Key Laboratory of Multiphase Flow in Power Engineering
Xi'an Jiaotong University

Dr. Jinwen Shi received Ph.D degree of Power Engineering and Engineering Thermophysics (Jun. 2012) in Xi'an Jiaotong University. He worked as a visiting Ph.D. student (Oct. 2008~Sep. 2009) at National Institute for Materials Science in Tsukuba, Japan. He is an associate professor at the International Research Center for Renewable Energy, State Key Laboratory of Multiphase Flow in Power Engineering, School of Energy and Power Engineering, Xi'an Jiaotong University. His research interest is focused on conversion and utilization of renewable energies, new energy materials, and photocatalysis, especially the development of novel photocatalysts and photocatalytic systems for water splitting under visible-light irradiation. He has published over 100 SCI-indexed papers in international journals (including 9 highly cited papers indexed by ESI and 1 paper selected as Top 50 most popular articles published in Journal of Materials Chemistry A in 2021), and was granted over 10 China invention patents. He achieved awards, such as the Wu Chung-hua outstanding student award (issued by Chinese Society of Engineering Thermophysics in 2012), the Excellent Paper Awards (issued by 11th China Hydrogen Energy Conference& 3rd Mainland, Taiwan, and Hong Kong Symposium on Hydrogen Energy in 2010, and by Progress in Natural Science: Materials International in 2015), the Excellent Doctoral Dissertation awards (issued by Shaanxi province in 2014), and the first prize in Science and Technology (ranking 7, issued by Shaanxi Province in 2017).

Title： The kinetics regulation of photo-generated carriers in g-C_3N_4 by bulk/surface engineering towards high-efficiency photocatalytic H_2 production

Abstract：

Graphitic carbon nitride (g-C_3N_4) has been extensively studied as a metal-free and visible-light-responsive photocatalyst in the realm of solar catalysis for H_2 production. The unique merits of low cost, good physicochemical stability, regulable electronic band structure and non-toxicity make g-C_3N_4 have significant advantages for the potential industrial application. However, it still remains great challenge to achieve critical breakthrough in H_2-production efficiency due to the low ultilization of photo-generated carriers in g-C_3N_4. Herein, we make a summary of our previous works about the bulk/surface engineering of g-C_3N_4 to adjust the kinetics of photo-generated carriers for promoting photocatalytic H_2 production, including precursor recrystallization, functional groups insertion, novel g-C_3N_4 development, nanosheets exfoliation designation, device development for surface functionation, surface reactive sites adjustment towards low-cost photocatalysis and overall water splitting. We demonstrate a series of

research strategies and theories in the understanding of the structure–carriers–photocatalysis relationship of g-C_3N_4, which could provide a meaningful reference for developing highly efficient g-C_3N_4 photocatalytic systems towards solar energy conversion and industrialapplication.

Keynote： Associate Professor Juancheng Yang

State Key Laboratory for Strength and Vibration of Mechanical Structures
School of Aerospace
Xi'an Jiaotong University

Dr. Juancheng Yang received his PhD degree in Harbin Institute of Technology in 2013. After working as a postdoctoral fellow at University of Chinese Academy of Sciences (UCAS), he joined the Xi'an Jiaotong University as an associate professor in July 2015. His research interests are the magnetohydrodynamics (MHD) of liquid metal flows related to nuclear fusion and electromagnetic metallurgy, including the measurement methods of liquid metal flow, liquid metal free surface flow, liquid metal droplet dynamics, liquid metal thermal convection, et al. He has published more than 40 refereed journal papers. The citation of his paper is more than 700.

Title： Influence of magnetic field on the dynamics of liquid metal droplets impacting on solid or liquid surface

Abstract：

The impingement of droplets on the solid surface or liquid film is a very common phenomenon in both daily life and industrial applications. Regarding the conventional liquid drop, a considerable amount of theoretical, simulation and experimental work is done. However, when the impingement of droplet which is formed by liquid metal with larger surface tension, density and conductivity than common liquid, happens in an environment with a magnetic field, the dynamic of droplet motion naturally been changed due to the action on flow by extra body force, Lorentz force. Due to limited data, the corresponding magnetohydrodynamic (MHD) effects on drop impingement are far from fully understood. Here, the present study investigates the liquid metal drops impacting a solid or liquid surface with the external magnetic field. The eutectic alloy of gallium, indium, and tin (GaInSn) which is in the liquid state at room temperature is adopted. The magnetic field is aligned with the horizontal direction with its strength can be adjusted continuously from 0 to 20000 Gs. When the liquid metal drop impacts the solid surface, the elliptical spreading pattern of a liquid metal droplet induced by the horizontal magnetic field is discovered. A non-dimensional parameter is introduced to get scaling laws for the averaged maximum spreading factor and the aspect ratio of the elliptical shape at the moment of maximum spreading. When the liquid metal drop impacts on the liquid metal free surface, we observe three

typical outcomes after drop impacts on the film, namely, symmetric crown, asymmetric crown, and prompt splashing, among which the asymmetric crown is first discovered by the present experiments. Finally, to fully understand the phenomena observed, by selecting typical cases, numerical simulations are carried out.

Keynote： Associate Professor Libor Pekař

Faculty of Applied Informatics, Tomas Bata University in Zlín, Czech Republic
Department of Technical Studies, College of Polytechnics Jihlava, Czech Republic

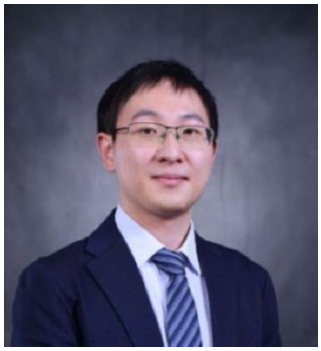
Libor Pekař received the B.S. degree in automation and informatics, the M.S. degree in automation and control engineering in consumption industries, and the Ph.D. degree in technical cybernetics from Tomas Bata University in Zlín, Czech Republic, in 2002, 2005, and 2013, respectively. From 2006 to 2013, he worked at the university as a Junior Lecturer, where he became a Senior Lecturer, in 2013, and was appointed as an Associate Professor, in 2018. He is currently an Associate Professor at the Faculty of Applied Informatics, Tomas Bata University in Zlín. He is the author of one book and eight book chapters, more than 45 journal articles, and 70 conference papers. His research interests include analysis, modeling, identification, and control of time-delay systems, algebraic control methods, autotuning, and optimization techniques. Dr. Pekař received the Laureate of the ASR Seminary Instrumentation and Control in 2007 and 2009, and the Rectors' Award for the Best Ph.D. Thesis in the Faculty of Applied Informatics, Tomas Bata University, in 2013. He served as the Lead Guest Editor for special issues in Advances in Mechanical Engineering journal and Mathematics journal, and as the Guest Editor for a special collection in Frontiers in Energy Research journal. He has been an Editor of Mathematical Problems in Engineering, since 2018, and AppliedMath journal, since 2022. He has served as a Reviewer for contributions to many highly regarded SCIE journals

Title： On the identification and robust control of a delayed heat-exchanger process.

Abstract：

This contribution presents possible techniques to identify and control a simple heat-exchanger process with delays. An air-liquid heat exchanger is included in the system. Two approaches to determining a model are given to the reader. Namely, an analytic-numerical anisochronic modeling principle and a relay-feedback identification test. Although the delay-free dynamics of the process is very simple, the inclusion of internal delays makes the full dynamics much more complex and tricky, since an infinite-dimensional model is eventually obtained. Such systems are challenging to be controlled. Hence, an algebraic robust controller design is proposed herein, and its performance is verified by simulations and laboratory measurements.

Keynote: Prof. Dr. Lin CHEN



Institute of Engineering Thermophysics, Chinese Academy of Sciences, China
University of Chinese Academy of Sciences, China

Dr. Lin Chen is now a full professor in the Institute of Engineering Thermophysics, Chinese Academy of Sciences and jointly at the University of Chinese Academy of Sciences, China. He is currently one Board member of Experts Commission of China Energy Society. He obtained his B.E and PhD in Mechanics (Energy and Resources Engineering) from Peking University. He was previously a JST-CREST and JSPS Research Fellow and an Assistant Professor in Tohoku University, Japan. His current research topics include energy resources, supercritical fluids, soil remediation, advanced measurement technologies. In recent years, he has authored over 160 well-cited international journal papers and/or conference presentations, 16 patents and 7 chapters, 3 books, including the most famous one on energy conversion ("Handbook of Research on Advancements in Supercritical Fluids Applications for Sustainable Energy Systems", IGI Global, 2021, 821 pages). He revealed the heat transfer laws and stability conditions of supercritical fluid based natural circulation, which is in the TOP5 most-cited list of Elsevier. Recently, he is focused on CO_2 based energy system and utilization processes. He is a winner of the President Scholarship, National Scholarship (MOE), Elite Scholar (PKU) and many other honors/awards. He was the winner of the Young Scholar Award of the Asian Union of Thermal Science and Engineering (AUTSE) in 2018 due to his contribution in supercritical fluid thermodynamics. He is currently an Associate Editor of the ASME Journal of Nuclear Engineering and Radiation Science and an Editorial Board member of the Journal of Supercritical Fluids (Elsevier).

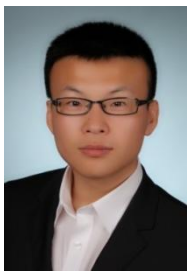
Title: Jet Dynamics and Complex Phase Behaviors of Supercritical CO_2

Abstract:

The physical processes of supercritical and transcritical jets have been found in a wide series of applications such as the separation of substances in chemical industry, and fuel injection in many high-pressure combustion devices including diesel engines, gas turbines and liquid rocket engines. A supercritical jet is associated with the injection of liquid at subcritical temperatures into an environment where the temperature and pressure exceed its thermodynamic critical point. When the receiving chamber is in subcritical state, a trans-critical jet can be found. The quantitative measurement of transcritical jet under the influence of high pressure effect and transient effect is

the key issues in such analysis. In this talk, an improved phase-shifting interferometer system with high temporal and spatial resolution (0.001 s, 3.45 μm) has been realized by pixelated-array masked method to investigate characteristics in trans/supercritical jet processes. The transient density field and boundary structure of the phase-transition interface during four jet processes under sub/trans/supercritical conditions were quantitatively measured. The results show that the characteristic of subcritical jet is with fragmentation and atomization within the experimental cell due to the presence of interfacial tension and strong density pulsations. The atomization is suppressed by high pressure effect in supercritical jet. Instead, single-phase mixing occurs due to the absence of surface tension. Discussions on the transition process from “liquid-like” and/or “gas-like” phases during a jet flow are also made based on the measurement resutls.

Keynote： Dr.-Ing Lingxi Li



Department of Electronic and Electrical Engineering
University College London

Lingxi is currently a postdoctoral researcher at University College London. His research interest is computational modelling of light scattering of nanostructure and small particles. In 2012, He received his bachelor's degree from Xi'an JiaoTong University in China. He received his Master and Dr.-Ing in Mechanical Engineering from Technische Universität Darmstadt (Germany) under the supervision of Prof. Dr.-Ing Cameron Tropea. His thesis work focused in light scattering of small particles for developing the optical measurement technique for the particle characterization. He joined the Photonics Innovations Lab in University College London in July, 2021 to work on vanadium dioxide based devices for thermal management.

Title： Simulation of light scattering from a colloidal droplet using a polarized Monte Carlo method: application to the time-shift technique.

Abstract：

This study is devoted to the development and application of a Monte Carlo ray-tracing model to simulate light scattering when a colloid suspension droplet passes through a focused Gaussian laser sheet. Such scattering scenarios arise when using the time-shift measurement technique for particle sizing. The incident laser sheet is treated as a large number of polarized light rays: the Stokes vector of each light ray is tracked, achieved by multiplication of the rotation matrix and the Mueller matrix after each scattering event. For the Monte Carlo simulation of light scattering, a very important issue is to generate the deflection angle and azimuthal angle for the new propagation direction after each scattering event, for which the rejection sampling method is used. Measurements verify the ability of the code to properly simulate this light scattering scenario.

Keynote： Dr. Litao Zhu

Department of Chemical and Biological Engineering, University of British Columbia;
Department of Chemical Engineering, Shanghai Jiao Tong University.

Litao Zhu received his B.S (2014) in Chemical Engineering from Dalian University of Technology, M.Eng (2017) and Ph.D (2021) in Chemical Engineering from Shanghai Jiao Tong University. His research interests are Multiphase flows & reactors, Heat and mass transfer, Blood flow, Multiscale CFD modeling, Data-driven modeling/analytics, Machine learning. He published over 30 peer reviewed papers in international scientific journals (>20 first/corresponding author articles), e.g., AIChE J., Chem. Eng. Sci., Ind. Eng. Chem. Res., Chem. Eng. J. He received three invited talks and was invited to review papers for many scientific journals. He won the 'CPCIF-Clariant Clean Tech Award', the Canada's prestigious 'Banting Postdoctoral Fellowships', the 'Outstanding Doctoral Graduation Award of Shanghai' and the 'Excellent Student Presentation Award', etc. Recently, he was invited as Guest Editor of a special issue of Ind. Eng. Chem. Res. on 'Machine Learning and Data Science in Chemical Engineering'.

Title： Data-driven analytics to inform forces and torques in particle-laden flows

Abstract：

This talk will present recent advances in modeling of mesoscale/microscale hydrodynamics, heat transfer and chemical reactions in particle-laden flows using the data-driven method and the ML-augmented method. In particular, we will introduce a microstructure-based probability-driven point-particle model (MPP) and a physics-informed neural network (PINN) model that can predict particle-to-particle force and torque fluctuations in a fixed bed of randomly distributed monodisperse spheres. Note that the above models incorporate the effect of local neighborhood of particles. We will discuss in detail how to leverage the statistical information obtained from particle-resolved direct numerical simulations (PR-DNS) to establish force/torque conditioned probability distribution maps that can be used as basis functions for regression. Moreover, we will present ideas and undergoing implementations on further extension development of the above MPP. The ultimate goal is to apply the constructed MPP model for Eulerian–Lagrangian simulations.

Keynote： Associate Professor Marco Jose Da Silva

Department of Electrical and Computer Engineering
Federal University of Technology-Parana, Brazil

Marco Jose da Silva received the Dr.-Ing. degree in Electrical Engineering from Dresden University of Technology, Germany, in 2008. From 2004 to 2009 he was a Research Associate with Helmholtz-Zentrum Dresden-Rossendorf, Germany. In Year 2010 he joined the Federal University of Technology-Parana (UTFPR), Brazil, as Assistant Professor. Since 2013 he has been an Associate Professor (tenured) at the Department of Electrical Engineering (CPGEI) and since 2017 he has also been co-Director of the Multiphase Flow Center (NUEM) at UTFPR. In September 2022 he will join the Johannes Kepler University Linz, Austria as Professor and Head of Institute for Measurement Technology. His research interests include measurement technology, sensors, and instrumentation applied to industrial processes and in special to multiphase flow monitoring. He is the author/co-author of over 200 scientific journal and conference papers and was granted 5 patents. Dr. Da Silva is Associate Editor-in-Chief of IEEE Sensors Journal and is with the Editorial Board of Measurement Science and Technology.

Title： Wire-mesh sensors: principles and applications for multiphase flow monitoring

Abstract：

Wire-mesh sensors (WMS) represent a hybrid solution between tomographic flow imaging and intrusive probes which have been widely applied for the investigation of different types of multiphase flow, but largely in gas-liquid flows. WMS can produce cross-sectional images of phase distribution at high temporal and spatial resolution. Advanced data processing is usually applied to extract derived flow parameters. In this talk, I will review the operating principles of this imaging flow modality (conductance, capacitance and dual modes) as well as I will show and discuss different applications WMS was successfully applied to. Some variations on the original geometry/principle will also be discussed along with some current trends for the further development and optimization of this versatile measurement technique.

Keynote： Professor Min Xiang

College of Aerospace Science and Engineering
National University of Defense Technology

Min Xiang received her PhD degrees in National University of Defense Technology in 2011. She was also a postdoctoral researcher at the Tsinghua University and visited the RMIT University (Melbourne, Australia) as a visiting scholar. Her research focuses on trans-media aircraft and multiphase flow dynamics. She is currently a member of the Multiphase Flow Branch of the Chinese Society of Engineering. She has obtained continuous funding by the Nature Science Foundation of China (NSFC) and is currently in charge of more than 10 projects supporting her research. She has published over 40 journal papers in top journals and published 1 monograph. She has received the outstanding teaching award and won the first prize of teaching achievement at NUDT.

Title： Interaction mechanism between a ventilated supercavity with exhausted hot gas

Abstract：

Supercavity is acknowledged as a promising technology in ultrahigh speed, cross-medium projectiles due to its high drag reduction efficiency. For underwater supercavity vehicles powered by jet propulsion, the disturbance of the tail jet may cause the deformation, oscillation and collapse of the cavity interface, which brings new challenges to the accurate prediction and stability control of the cavity shape. In this research. based on self-designed open water tunnel platform and small solid rocket motor, the effect of underwater exhausted gaseous jet on ventilated supercavity was studied. The temperature of the gas generated by the engine can reach 800K, and the flow rate was about 20g/s, then an over-expanded jet state was formed through the tail supersonic nozzle. Different from past literature, a new mechanism of cavity instability induced by tail jet was found in this experiment. During the operation of the engine, ignition was carried out under the premise of cavity covering. When the strong tail jet was turned on, extremely high instantaneous pressure caused the cavity to be squeezed and shrunk forward. Thereafter the overall shape was greatly deformed. When the cavity interface was curved beyond a certain level, a strong liquid was re-entrained inside the cavity, which would further induce the cavity to burst into fog state. When the pressure was recovered, the cavity was eventually rebuilt until closing at the nozzle outlet. Then, the influence of various factors such as the model length and shape were analyzed. It was verified that increasing the model length and using the step tail was beneficial to suppress this kind of instability. However, large step could cause interference between supercavity and the test body. Therefore, an optimum length-to-diameter ratio exists for the supercavitating vehicle.

Keynote： Professor Pavel Skripov

Institute of Thermal Physics of the Ural Branch of the Russian Academy of Sciences, Ekaterinburg, Russiay

Pavel Skripov, born in 1955, citizen of the Russian Federation. Institute of Thermal Physics of the Ural Branch of the Russian Academy of Sciences. The author (co-author) of about 200 publications, including 100 journal articles. Scientific degree, academic title: The degree of Candidate of Physical and Mathematical Sciences was awarded in 1986; academic degree of Doctor of Physical and Mathematical Sciences awarded in 1999; the title of professor in Thermal Physics was awarded in 2018. Experience of scientific work is 45 years. The experience of pedagogical work is 30 years. Led the author's lecture course "Thermal Physics of Fast Processes". Supervised 7 candidates of sciences (Ph.D.). At the Institute of Thermal Physics, he conducts research in the field of development of high-speed methods for studying heat transfer and thermophysical properties of complex compounds in the course of pulse heating. Leads the research of not fully stable liquids superheated with respect to the liquid-vapor equilibrium line and/or the liquid-liquid equilibrium line, as well as supercritical fluids.

Title： Heat transfer by not fully stable fluids: key findings

Abstract：

The report marks the 95th anniversary of the birth of V.P. Skripov, author of the classic study of superheated and supercooled liquids. It presents a discussion focused on the early work carried out by Skripov and his research team during the 1950s and 60s. Due to their pioneering nature, these works laid the foundation for the study of metastable liquid states. lthough they remain relevant to this day, these groundbreaking works remain unknown to most non- Russian-speaking readers. As well as elucidating the behavior of the heat capacity of a solution in the liquid- liquid critical region, his research also concerns the features of light scattering and free-convective heat transfer in the liquid-vapor critical region of a one-component system. The issues involved in the discussion are united by the fluctuating nature of such phenomena. Indeed, the very possibility of their experimental study is due to a significant increase in the scale of fluctuations of the corresponding quantities when approaching the critical point. The ongoing development of the approaches proposed in these papers for solving contemporary problems in the thermophysics of superheated/supercritical fluids is discussed.

Keynote: Professor Prashant Valluri

Personal Chair in Fluid Dynamics and Head of Graduate School
Institute for Multiscale Thermofluids, School of Engineering,
The University of Edinburgh

Professor Prashant Valluri received his PhD (2004) in Chemical Engineering from Imperial College London. His research focuses on tackling industrial multiphase flows with phase-change using bespoke numerical and theoretical techniques. These include stability analyses to understand interfacial instabilities, and DNS for combined heat-mass-momentum transport such as flows with phase change, and flows with mass-transfer and interfacial reactions. He is a Professor of Fluid Dynamics and the Chair of the UK-wide Multiphase Flows and Transport Phenomena Special Interest Group under the UK Fluids Network. As PI of ARCHER/HECToR eCSE 0804, e174 and e643 projects he led development of the ultra-fast high resolution TPLS 3.0 (Two-Phase Level-Set: https://sourceforge.net/projects/tpls/) and the GIS 1.0 (Gerris Immersed Solid Solver: https://github.com/eessmann/GISS) solvers. These solvers have been employed to gain understanding of fundamental phenomena during phase-change cooling of microelectronics. He is the Coordinator and the PI of the five-continent ThermaSMART project (funded by the European Commission) in which China is a major contributor with participation of Tianjin University of Commerce and Dalian Maritime University with 19 other major international participants

Title: Multiphase Flows Speak the Language of Instabilities

Abstract:

Multiphase flows in industry exhibit myriad regimes driven by instabilities ranging across spatial and temporal scales. This is largely due to the complex interplay between momentum, heat and mass transfer occurring within these flows. Citing our recent work on evaporating droplets and interfacial flows, my talk will present a three-pronged approach of direct numerical simulations, experiments and stability analysis to reveal complexities in these multiphase and multicomponent flows. Understanding these complexities is critical towards designing engineering systems such as that of cooling of microelectronics or oil-gas pipelines.

Keynote： Dr. Qiuya Tu

Institute of Engineering Thermophysics, Chinese Academy of Sciences

Qiuya Tu received her Ph.D degree from University of Florida in December 2012, major in Mechanical Engineering. After working in Halliburton as a senior technical professional, she joined the Institute of Engineering Thermophysics, Chinese Academy of Sciences in 2015 as an assistant professor, focusing on the gas-solid multiphase flow, specialized in the fundamental research of CFD simulation of gas-solid flow and their application, experimental measurement, and mechanism study of particle mixing, wetting, and drying process in fluidized bed. She has published more than 30 peer-reviewed papers, and is a member of the Youth Committee of Process Simulation and Simulation of the Chemical Industry and Engineering Society of China.

Title： Application of three-dimensional full-loop CFD simulation in CFBs

Abstract：

Circulating fluidized beds (CFBs) have been widely applied in coal combustion and gasification industry due to their excellent performance in terms of fuel flexibility and effectiveness of emission control. However, due to the lack of a deep understanding of the inherently complex gas-solid flow hydrodynamic behavior, the design, optimization, and scale-up of CFBs are underdeveloped. Computational fluid dynamics (CFD) has become as a promising method to study CFBs, including understanding the complex hydrodynamics of gas-solid fluidization characteristics, exploring the underlying mechanism of gas-solid flow, and optimizing the design of CFB as well as scaling up. This paper reviews the application of three-dimensional full-loop CFD simulation in “cold” flow CFBs. Firstly, detailed CFD models and some key issues related with the interphase drag model as well as turbulent models are discussed. Secondly, flow dynamic characteristics in different flow regimes and components in CFBs, i.e., riser, riser exit, cyclone, standpipe and loop-seal, are reviewed and discussed. Most of the CFD simulation results are validated with available experimental data, but there are still lots of problems existed and needs to be solved for the accurate CFD simulation of CFBs. Finally, the future challenges and development trends in the full-loop CFD simulation for CFBs are highlighted. This comprehensive review will provide valuable information for the design, optimization and scale-up of CFBs.

Keynote： Associate Professor Sherman C.P. Cheung

School of Engineering, RMIT University

Associate Professor Sherman Cheung is a numerical modelling expert in the School of Engineering at RMIT University. He obtained his Ph.D degree in Fire Dynamics Modelling from the City University of Hong Kong in 2006. Dr Cheung has substantial research experience in population balance modelling, gas-liquid multiphase flows, numerical heat and mass transfer. His research interest spread across various fields, including fire dynamics simulations, gas-liquid hydraulic analysis, HVAC and industrial designs, multi-objective optimization, hydrogen fuel cell modelling, and slurry electrode systems. He has published over 140 articles in peer-refereed journals and international conferences with an h-index of 30 and cover 2400 citations. He has been awarded the prestigious Victoria Fellowship by the State Government of Victoria in Australia, and the Research Fellowship for International Young Scientists by the National Natural Science Foundation of China in 2015. Dr Cheung has been awarded over $8.0 million in research funding from various research grants, including Australian Research Council (ARC) Industrial Transformation Training Centres, ARC Discovery Projects, Linkage Projects and Australian Renewable Energy Agency (ARENA) . He has also involved in various industrial design and optimization projects with Boeing, Ford, Aurecon and Defence Science and Technology (DST) in Australia

Title： Modelling subcooled boiling flows at low pressure: a complex multi-scale phenomenon

Abstract：

Modelling subcooled boiling flow remains an attractive yet challenging research topic in gas-liquid multiphase flows, especially at low pressure conditions. By nature, it is an extremely complex flow embracing various heat transfer, physics, and interfacial effects. To properly model subcooled boiling flows, it is inevitably to account for the dynamic behaviours of two-phase flow and bubbles undergoing coalescence, breakup and condensation in the bulk subcooled liquid but also the characterization of the single-phase and local boiling heat transfer phenomena in the near-wall region. Performing calculations without appropriate considerations of these mechanisms can at best only provide a rough estimation of the heat transfer rate from the heated surface and the flow structure of the whole system. This study firstly discusses the fundamental mechanisms and physical phenomena embedded in the subcooled boiling flows. Attention is then focused on a comprehensive survey of existing modelling frameworks capturing the complex bubble dynamics, heat and mass transfer on the heated surface, and the population balance of bubble size

distribution. Finally, the latest developments using molecular dynamics simulation in this space and its future research direction in multi-scale modelling are also discussed.

Keynote: Dr. Shibo Kuang

ARC Research Hub for Computational Particle Technology
Department of Chemical and Biological Engineering
Monash University (Clayton)

Dr Shibo Kuang is currently a research fellow in ARC Research Hub for Computational Particle Technology at Monash University. His research interests centre around computational process engineering. It aims to achieve fundamental elucidation, theory and method establishment, new technology exploration, and process optimization for multiphase transportation and processes. Both physics-based models and data-driven (AI) models are thus developed and applied. The research topics cover particle transportation, particle separation, and multiphase reacting flows. In this direction, he has supervised/joint-supervised 27 PhD students (14 completed so far), 6 exchange PhD students (completed) and 3 masters students (completed), published over 110 papers (96+ Q1 and Q2 JCR journal papers). According to Google Scholar, the number of citations from these publications is about 3100 (H-index=29). He has been invited to deliver over 20 invited lectures (including 10 keynote/plenary lectures) at international avenues. He is currently a key reader (equivalent to an associate editor) of Metallurgical and Materials Transactions B.

Title: Modelling and analysis of non-Newtonian suspension flows.

Abstract:

Non-Newtonian fluid suspension flows are common in nature and many industries. Our knowledge about such a flow system is very limited. This situation hinders the development of a general method for the reliable scale-up, design, control, and optimization of such flow systems. To fill this gap, we have developed and validated discrete element method (DEM) based models to study non-Newtonian fluid suspension flows, with the support of physical laboratory experiments. In this modeling, the particle motion is described by the DEM, and the non-Newtonian fluid flow is solved using either the Lattice Boltzmann method or finite volume method equipped with different rheology models. The particle-fluid interactions are modeled by a resolved or unresolved method. The resolved method solves the particle-fluid interactions directly, whereas the unresolved one is based on certain correlations. Via the developed models, non-Newtonian fluid suspension flows have been studied in various aspects, such as fluid drag force, non-Newtonian fluid turbulence, and specific engineering applications like pipe conveying, fluidization, and sand screen.

Keynote: Dr. Shuai Wang

School of Chemical Engineering, University of New South Wales

Dr. Shuai Wang is currently working as a postdoctoral fellow in the School of Chemical Engineering at the University of New South Wales, Australia. He received the B.E. degree and PhD degree in the College of Energy Engineering at Zhejiang University in 2014 and 2019, respectively. His research interests include i) multi-scale CFD-DEM simulation of dense gas-solid reacting flow; ii) high-efficient utilization of renewable energy resources, e.g., biomass, hydrogen; iii) high-performance parallelization computation; iv) thermochemical processes in ironmaking blast furnace; v) phase change in additive manufacturing. He serves as the guest editor of Frontiers in Energy Research, editorial board member of Energies, and Journal of Environmental Materials and Sustainable Energy. He has more than 50 publications by SCI and 1000 citations. He was awarded the “Wu Chung-hua Outstanding Graduate Student Award” in 2019 and the “Excellent Doctoral Thesis of the Chinese Society of Particles” in 2020.

Title: Discrete element simulation of dense gas-solid reacting flow

Abstract:

Dense gas-solid reacting flow involves complex multiphase flow, heat and mass transfer, and chemical reactions. Computational fluid dynamics-discrete element method (CFD-DEM) simulation has become a promising method to understand and optimize the dense gas-solid reacting systems. Despite its recently rapid advancement and successful applications to a variety of chemical engineering processes, a comprehensive introduction of the theory and applications that underpin the CFD-DEM modelling of dense gas-solid reacting flow has not yet been conducted. In this work, we give the recent progress in the development of CFD-DEM models and their applications to dense gas-solid reacting systems. The sub-models for describing the flow dynamics and thermochemical conversion are firstly presented in terms of numerical algorithms and corresponding implementations from flow to heat and mass transfer and speed-up methods. Then, the recent advancements of CFD-DEM applications in dense gas-solid reacting systems are given, with a focus on chemical engineering processes, e.g., biomass gasification, char combustion, blast furnace ironmaking, and PV pyrolysis.

Keynote： Assistant Professor Shuang Cui

University of Texas at Dallas

Dr. Shuang Cui currently is an assistant professor in the Department of Mechanical Engineering at the University of Texas at Dallas (UTD) and also a joint faculty member in the Buildings and Thermal Sciences Center at the National Renewable Energy Laboratory (NREL). Prior to that, Dr. Cui was a research scientist at NREL. She received her Ph.D. in Mechanical Engineering at the University of California, San Diego. Dr. Cui directs the Thermal Energy Storage and Conversion (TESC) Lab at UTD. Her research focuses on both fundamental study of nanoscale heat transfer and energy conversion and advanced materials development, spanning intelligent soft materials/devices and advanced thermal energy storage materials and systems. She collaborates with scientists and engineers from diverse fields including mechanical, electrical, chemical, and civil engineers, material scientists, and chemists to pursue her research projects on thermal metrology development for nanomaterials and smart materials for thermal regulation, energy storage, water harvesting, and desalination. Her research has been supported by multiple federal agencies (DOE BTO, TTO, ARPA-E, NREL, and UTD) and private sector partners (Wells-Fargo) leading to 20 peer-reviewed journal articles and 4 patents. She will continue her research on the development of green, intelligent, and energy-efficient living systems. Dr. Cui received President's Award for Exceptional Performance at NREL. She is also highlighted by the DOE "Women @ Energy: STEM Rising" and has been a selected participant of the International School for Materials for Energy and Sustainability VIII at Caltech, 2019 U.S. C3E Women in Clean Energy Symposium at Texas A&M University, and the Rising Stars Women in Engineering Workshop at Seoul National University (Korea).

Title： Phase change materials for energy-efficient thermal comfort control of buildings

Abstract：

The buildings sector accounts for over 40% of all U.S. primary energy consumption and associated greenhouse gas (GHG) emissions. In 2018, ~7.59 quads of energy (equivalent to ~$20 billion) was lost through unnecessary large area environmental conditioning and poor thermal insulation of building components, making it imperative to reduce energy consumption in buildings through the development of next-generation, energy-efficient building technologies and practices. Superabsorbent polymers, or hydrogels, are materials that contain more than ~ 90 wt% water and are commonly used in contact lenses, wound dressing, tissue engineering, and drug delivery. Recently, hydrogels have been proposed for temperature and humidity control of

buildings due to their superabsorbent and environmentally friendly capability. The goal of this study was to develop hydrogels-based phase change materials for energy-efficient thermal comfort control of buildings. Multiple approaches at the forefront of hydrogels for next-generation building technologies have been studied including the development of artificial 'skins' for building cooling, thermo-responsive adsorbents for moisture control, and composite phase change materials (PCMs) for thermal energy storage.

Keynote： Doctor Sida Liu, A. Prof.

Jiangxi Key Laboratory for Simulation and Modelling of Particulate Systems
Jiangxi University of Science and Technology

Dr. Sida Liu completed his PhD from Monash University in Australia in 2015 and served as a postdoctoral researcher at Monash University in the same year. In 2017, he joined Jiangsu Industrial Technology Research Institute of Industrial Process Simulation and Optimization as a project manager, and the executive deputy general manager of the incubated enterprise of the Institute in the same year, In 2020, he joined Jiangxi Aobo Particle Technology Research Institute as the chief researcher. In 2021, he joined Jiangxi University of Science and Technology. Dr. Liu is engaged in the development and application of complex multi-scale multiphase flow models using advanced computing methods in the field of particle science.

Title： DEM Study of Particle Shape Effects on Hopper Flow in a Cylindrical Bin

Abstract：

Hopper flow characteristics are significantly affected by particle shape. In this report, ellipsoidal particles which can represent a large number of shapes are used to investigate the shape effect on granular flow in a cylindrical hopper. Numerical experiments are conducted by use of discrete element method, with its validity verified by comparison with the results from physical experiments. The results indicate that particle shape can make a significant effect on the flow pattern. In particular, the increase of deviation from sphere can decrease mixed region adjacent to the side wall, and increase the stagnant zone at the bottom corner. It may also lead to decreased wall stress. The results show that due to the better flowabilities, spheres exert higher maximum stress on walls than ellipsoids. Wall stress for ellipsoids approaches a constant value quickly. It is also found that the wall stress distribution is not affected much by orifice size, but solid bed height. Furthermore, particle shape has a significant effect on the discharge rate. Spheres of unity aspect ratio have the highest flow rate, and the lower or higher aspect ratio, the smaller the flow rate. Based on the numerical results, the an attempt is made to characterize the two parameters of wall friction coefficient μ and the lateral stress ratio K_A in Jessen-Walker-Walters theory, indicating that both μ and K_A vary with aspect ratio of ellipsoids. The assumption of the constant μ and K_A may bring significant error in the wall stress prediction. The Beverloo equation is also modified, where parameters C and k in the equation are respectively formulated as a function of aspect ratio.

Keynote： Associate Professor Takuya Tsuji

Department of Mechanical Engineering
Osaka University

Takuya Tsuji received Ph.D in Engineering from Kyushu University in 2004 and has started his faculty career as an assistant professor in Osaka University. He became a research associate professor in 2009. Since 2012, He is an associate professor in the department of mechanical engineering, Osaka University. During 2015/5-2015/9, he was a guest professor in Swiss federal institute of technology Zurich. He has more than 50 publications in peer-reviewed journals in physics and engineering and received 13 awards including SPTJ best paper award in 2011 (The Society for Powder Technology, Japan), Frontier Award in 2015 (Fluid and Particle Processing Division, The Society of Chemical Engineers, Japan), and Frontier award in 2021 (Fluids Engineering Division, Japan Society of Mechanical Engineers). He served as an editor of Advanced Powder Technology journal. He is interested in the numerical modeling and physical elucidation of dense gas-solid, liquid-solid, gas-liquid-solid flows in addition to granular flows.

Title： Density segregation of granular materials in vibrated gas-fluidized bed (coarse-graining DEM-CFD and experimental investigations)

Abstract：

Density segregations of binary particles in a vibrated fluidized bed are investigated numerically and experimentally. A numerical model is constructed by coupling the discrete element method (DEM) with the computational fluid dynamics (CFD) in a non-inertial frame of reference. An upscaled coarse-graining model is employed to prevent the large computational cost of DEMCFD. After the validation study of the model, the change of segregation behaviors depending on gas inflow velocity is investigated. A sudden change from reverse to forward segregation observed experimentally is reasonably captured numerically, and its physical mechanism is discussed in detail. In addition to the positive gas pressure gradient in the vertical direction, the particle transportation to the bed bottom induced by the wall friction plays a major role in the segregation.

Keynote： Associate Professor Timothy Hunter

School of Chemical & Process Engineering
University of Leeds, UK

Dr. Hunter is an Associate Professor in Chemical and Nuclear Engineering, and is head of the Nuclear Engineering Group within the School of Chemical & Process Engineering (https://eps.leeds.ac.uk/chemical-engineering-sustainable-systems-processes/doc/nuclear-engineering). He has >80 publications in the areas of applied colloid and particle science, as well as multiphase suspension and slurry processing, while he has also been an investigator on +?3m in funding from UKRI, EU H2020 and industry. His main current motivation in multiphase flows is in advanced in situ characterisation methods to safely monitor the transfer and separation of radioactive wastes, and also the development novel, intensified effluent treatment processes. Of particular relevance to the IMFTF, he is currently an investigator on the UK's EPSRC funded TRANSCEND Consortium (https://transcendconsortium.org/) on the design of novel online acoustic backscatter systems for remote slurry monitoring, while he is also an investigator on UK-Korea funded work into electrokinetic separation for enhanced decontamination. He was also work package lead for the EU H2020 funded ProPAT project (http://pro-pat.eu/) on the development of advanced measurement and control systems for industrial multiphase process systems in the high value chemicals and minerals sectors.

Title： The use of ultrasonics for online characterisation of multiphase suspension flows and separation: Applications in nuclear waste processing.

Abstract：

Within the UK nuclear environment, there is a considerable accumulation of legacy wastes in the form of liquid effluents and suspensions or sludges, contained in various ponds, silos and tank storage areas. For many waste operations, there are significant challenges to safe and efficient waste processing, due to their complex compositions, poor current containment facilities and, most importantly, a lack of available characterisation data. In response to these problems, our research group have investigated the application of ultrasonics, as innovate online characterisation instrumentation. Presented in this talk will be a number of ongoing case studies, where novel backscatter profilers have been used to monitor nuclear waste transport in multiphase pipeflows, as well as larger waste separators and intensified agitated tubular reactors. Comparisons with predictions from computational fluid dynamics are also included, as ultimately, the UK nuclear industry seeks to use digital twins as a hazard free route to process understanding and optimisation.

Keynote：Dr. Toshio Tagawa

Department of Aeronautics and Astronautics
Tokyo Metropolitan University

Toshio Tagawa is an Associate Professor at Department of Aeronautics and Astronautics, Tokyo Metropolitan University, Japan. He received Dr. Eng. in 1997 from Kyushu University. He continued to study and work in the laboratory of Professor Hiroyuki Ozoe as a Research Associate and then moved to Tokyo Metropolitan University in 2005. He received the Award for Scientific Contribution in 2003 from the Heat Transfer Society of Japan. He has been engaged in the study of computational fluid dynamics, magnetohydrodynamic flows and heat transfer in natural convection and two-phase flows, and currently jointly with Professor Kewei Song at Lanzhou Jiaotong University.

Title：A Lattice Boltzmann Method for multiphase flows with heat transfer

Abstract：

In this study, we developed a numerical code based on the Lattice Boltzmann Method (LBM) to compute the gas-liquid two-phase flow for a high-density ratio with phase change. When analyzing gas-liquid two-phase flow with phase change, it is usually to solve the pressure Poisson equation by an iterative method. However, when analyzing gas-liquid two-phase flow with phase change by that method, the iterative calculation time of the pressure Poisson equation is a problem because of high density ratio, large-scale analysis and so on. Therefore, in this study, we adopted LBM, which is a weak compression solution and does not require solving the pressure Poisson equation. However, when analyzing gas-liquid two-phase flow with phase change by LBM, numerical stability becomes a problem under the conditions such as high density ratio and violent flow. Therefore, we expanded the gas-liquid two-phase flow analysis method by Velocity based LBM, which has excellent numerical stability, and developed a calculation code that can analyze the gas-liquid two-phase flow with phase change. The governing equations are the mass conservation equation, the momentum equations, the energy equation, and the Conservative-Allen-Cahn (C-A-C) equation, in which the phase change is introduced as the source term and the temperature change of the physical property value is ignored. Using the developed code, we analyzed the Stefan problem and obtained results that were in good agreement with the analytical solution. We also tried to reproduce nuclear boiling by adding a microlayer model, conjugated heat transfer, and nuclear generation model to the calculation code. We obtained results that are in good agreement with an experiment regarding the bubble separation cycle, separation diameter, heat transfer coefficient, and so on. Furthermore, we succeeded in reproducing nuclear

boiling with a high density ratio and violent bubbles. In addition, it was confirmed that this calculation code can efficiently analyze the gas-liquid two-phase flow with phase change.

Keynote： Professor Wuliang Yin

School of Electrical and Electronic Engineering
The University of Manchester

Wuliang was a professor at Tianjin University (China) from 2007 to 2012; He then became a Mettler Toledo (MT) lecturer with the Department of EEE at Manchester University, U.K., in 2012, promoted to a Reader in Electromagnetic Sensors and Instrumentation in 2020. He is one of the pioneers in magnetic induction tomography and led the development of the first digital magnetic induction tomography system. He discovered and established rigorous science underpinning the link between steel microstructure and its electromagnetic properties and developed a novel instrument for monitoring key quality parameters in steel hot rolling processes. His work in I&M has impacted several industrial fields: his microstructure monitoring technology was patented, trademarked as EMspec® and commercialized by Primetals Technologies with installations in the UK and EU. A high speed portable multi-channel EM scanner was trademarked as Accuspect® and commercialised by TrainFX (UK). His work on non-contact rail inspection using EM sensing array has contributed to the safety of the UK Rail Network with many kilometers of track being inspected using this technology annually. He contributed to the development of MT's next generation metal detectors, enabling smaller metallic contaminates to be detected in food products and improving consumer safety. His work has been recognized by multiple awards: Williams Awards from The Institute of Materials, Minerals and Mining in 2014 and 2015; an IEEE Gold Medal as the most productive reviewer for IEEE Tran I& M in the UK in 2020; the Best Application Award from IEEE I&M Society in 2021, and IEEE I&M Society Graduate Fellowship awards as supervisor in 2018 and 2022. He is leading and involved in many projects supported by The Royal Society (London), The IEEE, EPSRC (UK), NSF and industrial sponsors: Siemens, Rolls-Royce, Tata Steel, Liberty Steel Group and MT, etc.

Title： Applications of Magnetic Induction Tomography (MIT): imaging molten steel flow and copper slag solidification processes

Abstract：

Magnetic Induction Tomography (MIT) or Electromagnetic Tomography (EMT) is an imaging modality for industrial process monitoring and biomedical imaging. It has been intensively studied and developed due to its non-contact, portable and low-cost features. This talk will briefly introduce the measurement principle of the MIT and then focus on two applications.

The first application involves the imaging of copper slag solidification processes. The design of a sensor that can work in the harsh temperature environments is described. Measurement trials conducted on a molten converter slag solidification process where the copper slag changes from molten state to solidification state during the cool-down for more than an hour is then presented. The phenomenon when the disorderly distributed metal gradually forms solid and permeable object was observed, which can indicate the status of the process. This is the first report of observing such a process by using an EMT system. Moreover location-based convergence analysis has been carried out in the imaging space and useful new insights have been gained for the copper production process, which would be difficult to obtain otherwise. Verification and calibration using XRD and SEM indicate the viability of the measurement method based on EMT.

The second application covers determining two-phase flow characteristics in the submerged entry nozzle and in the mold of a continuous casting model with combined electromagnetic tomography. It describes experiments on the combined determination of the distribution of liquid metal and argon in the submerged entry nozzle (SEN) and of the flow in the mold of a small-scale physical model of a continuous slab caster. Magnetic Induction Tomography (MIT) is applied for visualizing the metal distribution in the SEN, while the flow in the mold is determined by contactless inductive flow tomography (CIFT). Depending on the gas flow rate, various flow regimes are identified, among them pressure and mold level oscillations, transitions between double and single vortex flows, and transient single port ejections.

Keynote： Associate Professor Xiaonan Wang

Department of Chemical Engineering, Tsinghua University, Beijing, China.selected

Dr. Xiaonan Wang is currently an associate professor in the Department of Chemical Engineering at Tsinghua University. She received her BEng from Tsinghua University in 2011 and PhD from University of California, Davis in 2015. After working as a postdoctoral research associate at Imperial College London, she joined the National University of Singapore (NUS) as an assistant professor since 2017. Her research focuses on the development of intelligent computational methods including multi-scale modelling, optimization, data analytics and machine learning for applications in advanced materials, energy, environmental and manufacturing systems to support smart and sustainable development. She is leading a Smart Systems Engineering research group at NUS and Tsinghua of more than 20 team members as PI and also the deputy director of the Accelerated Materials Development programme in Singapore (S$25M funding). She has published more than 100 peer-reviewed papers, organized and chaired several international conferences, and delivered more than 50 presentations and invited talks at conferences and universities on five continents. She is an editorial board member of 10 SCI journals e.g. Applied Energy, ACS ES&T Engineering. She was recognized as an AIChE-SLS Outstanding Young Principal Investigator, Young Researcher Award for Engineering Sustainable Development, IChemE Global Awards Young Researcher finalist and for Royal Society International Exchanges Award,as well several best paper awards at IEEE and Applied Energy conferences and journals. She is also a program leader lead of the Association of Pacific Rim Universities (APRU)’s Sustainable Waste Management Program and advisory board member of several international organizations.

Title： Smart energy transitions towards a carbon-neutral future

Abstract：

Facing the pressing environmental and climate change challenges, novel approaches are needed for sustainable energy transitions towards a carbon-neutral future. The emergence of big data analytics, internet of things, machine learning (ML), and general artificial intelligence (AI) provide enormous smart tools for processing complex data and information generated from experimental and computational research, as well as industrial applications, which could revolutionize next-generation research, industry and society. The potential contribution of ML combined with big data and cyber-physical systems to energy and environmental is worth of investigation. In this talk, an overview of multi-scale smart systems engineering approaches and their applications in crucial domains of energy and environment management will be first given.

The recent developments of ML models and data-driven optimization that can expedite smart systems engineering development will be demonstrated via a series of use cases. The design, operation and management of multi-scale systems with enhanced economic and environmental performance are then presented. Finally, opportunities, challenges, and future directions of smart energy and environment management faced by the pressing carbon-neutrality or net-zero targets are discussed

Keynote： Professor Yaning Zhang

School of Energy Science and Engineering
Harbin Institute of Technology (HIT), Harbin, China

Dr. Yaning Zhang is a full professor at the School of Energy Science and Engineering of Harbin Institute of Technology (HIT) in China. He ever worked as a visiting scholar (2011-2012) and postdoctoral fellow (2013) at Dalhousie University in Canada, and a postdoctor at University of Minnesota Twin Cities in the USA (2016-2018). His research interests include biomass (mainly microwave-assisted gasification and pyrolysis), thermodynamics, etc. He has published 5 books, 10 book chapters and more than 130 journal papers with a H-index of 32. He serves as an associate editor for Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, and an editorial broad member for Biomass Conversion and Biorefinery, Biochar, Carbon Research, etc. He also served as a Guest Editor for Renewable Energy, Sustainable Energy Technologies and Assessments, Journal of Energy Resources Technology, Thermal Science, etc.

Title： Fluidization performances of particles in a microwave reactor

Abstract：

Fluidized bed technology has been widely used in industrial production (such as energy production, pharmaceutical, chemical engineering, environmental protection, etc.), and has been continuously improved with the requirements of today's society. Microwave-assisted fluidized bed technology is one of the development and hot spots. In this study, a lab-scale fluidized bed system was designed and developed for microwave-assisted gasification and/or pyrolysis, and the cold fluidization characteristics of particles (silicon carbide (SiC), biomass, plastic, etc.) in the lab-scale fluidized bed were studied and presented (SiC is one kind of microwave absorbent, it has the advantages of high microwave absorption ability, low cost and easy recycling). The effects of particle size, fluidization velocity and loading on fluidization performances were also investigated and presented. Hopefully, the contents presented in this study will not only supply some experimental data for well understanding particle fluidization performances but also give insights into microwave-assisted gasification and pyrolysis of organic wastes.

Keynote： Professor Yanlin Zhao

International Joint Laboratory on Clean Energy Science and Technology
College of Mechanical and Transportation Engineering
China University of Petroleum(Beijing)

Yanlin Zhao, full professor since 2019 in China University of Petroleum (Beijing). She focuses on the basic and applied research in the field of particles and multiphase flow, especially on the particle wall interaction effect and flow characteristics of multiphase flow. She is currently the member of the Teaching Committee of thermal engineering of higher engineering education of China Machinery Industry Education Association, the young director of China particle association, the member of multiphase flow measurement Committee of China Metrology and Testing Association, and the editorial board member of the international journal “Petroleum Science”. She undertook over 6 projects such as the National Natural Science Foundation Project and the Ministry of education's research start-up fund. She has 63 publications, including 44 indexed by SCI (15 / 18 papers by the sole first author / corresponding author), 602 citations by SCI, H=12. She has 2 Monographs (both first authors, Science Press), and 7 invention patents (6 first authors). In 2020, she won the excellent editorial board award of “Petroleum Science”. In 2019, she won the “Chen Xuejun” Award for outstanding papers of young scholars and the best paper award of the 11th International Conference on multiphase flow measurement". In 2021, she won the “excellent youth report award” of the 8th China UK particle forum. In 2013, she was selected into the “youth top talent program” of China University of Petroleum (Beijing).

Title： Synergistic erosion–corrosion behavior of X80 pipeline steel at various impingement angles in two-phase flow impingement

Abstract：

The purpose of this investigation was to document and understand the erosion-corrosion of X80 pipeline steel under different angles of attack in two-phase flow impingement. The erosion-corrosion behavior of X80 pipeline steel was studied by using sand jet. The weight loss, surface morphology and electrochemical performance of X80 pipeline steel under different angles of impact (30°, 45°, 60°, 75°, 90°) were studied at 12 m/s flow rate. The synergistic mechanism of erosion corrosion of X80 pipeline steel under different environment was analyzed. The experimental results show that the weight loss of the sample in pure water increased with the decrease of the impact angle. The weight loss of the sample in the sodium chloride solution decreased first and then increased with the decrease of the impact angle, reaching a minimal value

at 60◦ impact angle. Positive synergy was observed at all impact angles, and synergy was most significant when the impact angle was 90◦. The samples impacted at 30◦ showed the best corrosion resistance by electrochemical measurement. The corrosion resistance of the sample was consistent with the synergistic effect.

Keynote： Professor Yannis Hardalupas

Mechanical Engineering Department, Imperial College London

Yannis Hardalupas received his Mechanical Engineering degree from National Technical University of Athens, Greece, followed by PhD at Imperial College London. He was awarded an EPSRC Advanced Research Fellowship for experimental research on combustion of liquid and solid fuels before joining the academic staff at the Mechanical Engineering Department of Imperial College, where he was promoted to Professor in 2009. In 2000, he spent a year at Ricardo Consulting Engineers working on computational models for liquid atomization through a Royal Academy of Engineering industrial secondment award. His research covers combustion, heat and mass transfer, liquid atomisation and sprays and the development and application of novel optical and laser diagnostics. The latter led to patents for instruments on powder sizing, planar droplet sizing, nanoparticle sizing and novel imaging devices. His research contributed to gas- and liquid-fuelled land-based gas turbines, coal burners, aeroengines, gasoline and Diesel engines and liquid propellant rocket engines. He also researched spray drying and Cleaning-In-Place processes for the chemical and food industry and ‘nanofluids’ as improved coolants for fusion and fission reactors. He is a Fellow of the Institute of Physics and Associate Fellow and member of the technical committee of Propellants and Combustion of the American Institute of Aeronautics and Astronautics. He chairs the Combustion Physics Group of the Institute of Physics, is an Editor of Experimental Thermal and Fluid Science and serves at the advisory and editorial boards of Experiments in Fluids and Int. J. of Spray and Combustion Dynamics.

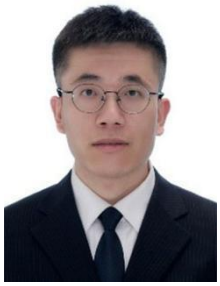
Title： Atomisation of sustainable liquid fuels for low carbon powerplants

Abstract：

Conventional hydrocarbon liquid fuels are used for land and marine transportation, aviation and power generation. However, they contribute to the increase of carbon dioxide in the atmosphere with consequences on climate change. New synthetic fuels are proposed, which are sustainable since they are produced from renewable energy sources by re-using captured CO2 (e.g. e-fuels, Sustainable Aviation Fuels), or biomass-derived fuels (e.g. biofuels). The sustainable liquid fuels can be used in existing powerplants, allowing fast deployment with limited change at the infrastructure, and therefore can deliver faster reduction of the CO2 emissions. However, these new fuels may have variable liquid properties (i.e. surface tension, density, viscosity), which may modify the atomization characteristics and influence the combustion process of current powerplants. The talk will consider the physics of the atomization and assess the potential impact of the liquid properties on spray characteristics. It will focus on the application of novel laser

based diagnostics to characterize the primary liquid breakup process at the near nozzle region of atomizers, which determines the downstream spray characteristics. It will demonstrate why current scaling approaches of the atomization process may fail to capture changes of the spray characteristics and suggest additional physical process that may explain changes in the spray characteristics.

Keynote： Associate Professor Yihang Li



Academy of Advanced Interdisciplinary Research, Xidian University

Yihang Li is an associate professor in the Academy of Advanced Interdisciplinary Research at Xidian University. He received his B.S. in Metallurgical Engineering from Central South University (CSU) in 2014 and PhD in Materials Science from University of Science and Technology of China (USTC) in 2019. After working as a postdoctoral fellow at Shenzhen University (SZU), he joined the Xidian University (XDU) as an associate professor since October 2021. His research interests are the Solid Oxide Fuel/Electrolysis Cells (SOFC/SOEC) and gas sensors, including synthesis & characterization of novel perovskite oxides and carbon dioxide reduction process at the surface and interface. He has written a book chapter (Intermediate Temperature Solid Oxide Fuel Cells, Elsevier, 2020, pp 195-261) and published over 30 peer-reviewed papers, e.g., Energy & Environment Science, Advanced Energy Materials, Journal of Materials Chemistry A, Journal of Power Sources, ACS Sustainable Chemistry & Engineering, and International Journal of Hydrogen Energy. He won the Qiushi Scholarship and National Scholarship for Graduate Student from USTC. He is a professional member of the Chemical Industry and Engineering Society of China (CIESC).

Title： Electrochemical CO2-to-CO conversion in solid oxide electrolysis cells

Abstract：

Depletion of natural energy resources and environmental deterioration are among the biggest challenges for sustainable development. Both issues are resulted from the unsustainable utilization of fossil fuels accompanied by the release of greenhouse gas CO2. In this regard, more and more attention has been focused on the processes of CO2 conversion to valuable fuels powered by nuclear enrgy or renewable electricity sources (e.g., solar, wind, tidal and hydropower), which could not only help to reduce CO2 emissions, but also mitigate the energy crisis. Solid oxide electrolysis cells (SOECs) can efficiently convert the greenhouse-gas CO2 to valuable chemicals. For example, CO2 is electrochemically reduced to CO at the fuel electrode (cathode) while releasing O2 at the oxygen electrode (anode). SOECs are considered as not only a promising technology base for sustainable energy systems but also helpful to achieve the goal of carbon-neutral cycling. This talk will present our recent advances in designing mixed conducting perovskite oxide materials as fuel electrodes for electrochemical CO2-to-CO conversion in SOECs. In particular, we proposed to investigate surface oxygen exchange (kchem) of CO2-RR kinetics using a new theoretical method based on the electrical conductivity relaxation (ECR) technique.

Keynote： Associate Professor Yi Li

Tsinghua university shenzhen international graduate school

Dr Yi Li, associate professor of Tsinghua university shenzhen international graduate school. The research interests include electrical tomography, gas-liquid multiphase flow measurement, gas-soild fludized-bed imaging measurement, AI-based distributed fiber-detection and measurement, NB-IOT measurement and sensing technology, etc. Dr. Yi Li is used to be the project leader of Chinese NSFC grant, Petro-China group project, National pipe network group project, CNOOC shale gas measurement project and Shenzhen government project of subsea oil and gas detection. Since 2014, the total funding is about 45 million RMB. Dr Yi Li is with 30+ peer-review published and more than 20 Chinese national patents, and also given 10+ keynote presentations of international and industrial conferences.

Keynote： Professor Zhizhao Che

Tianjin University, China

Zhizhao Che is a professor at the Key Laboratory of Engines at Tianjin University. He obtained his PhD degree in 2012 at Nanyang Technological University (Singapore). Before that, he obtained his B.Eng and M.Eng degrees at Harbin Institute of Technology in 2005 and 2007, respectively. Before joining Tianjin University in 2016, he worked as postdoc at Nanyang Technological University (Singapore) and Imperial College London (UK). His main research interest is multiphase flow and heat/mass transfer in power machinery, particularly droplet dynamics. He is the principal investigator of several research projects funded by National Natural Science Foundation of China, Natural Science Foundation of Tianjin City, etc. He has published 60+ SCI-indexed papers, including Journal of Fluid Mechanics, Applied Physics Letters, International Journal of Heat and Mass Transfer, Langmuir, etc., and several of them have been selected as cover stories or featured articles.

Title： Flow Dynamics and Heat Transfer of Droplets in Spray Combustion

Keynote： Associate Professor Zongyan Zhou

Jiangxi Key Laboratory of Simulation and Modelling of Particulate Systems, Jiangxi University of Science and Technology, Nanchang 330013, China
ARC Research Hub for Computational Particle Technology, Department of Chemical and Biological Engineering, Monash University, VIC 3800, Australia

Dr Zongyan Zhou, PhD (UNSW), is an adjunct professor at Monash University (Australia), a professor at Jiangxi University of Science and Technology (China), and the vice director of ARC Research Hub for Computational Particle Technology. His research expertise is in modelling and simulation of granular dynamics and multiphase flow and heat transfer in mineral, metallurgical and manufacturing industries. His significant contributions in the powder research community include theoretical developments of advanced modelling approach such as CFD-DEM, discrete approach for multiphase heat/mass transfer, non-spherical particles, and metal additive manufacturing. Prof Zhou has successfully won many major ARC research grants, and published ~150 papers. He has delivered many invited and keynote presentations and organized several mini-symposiums in international conferences and workshops, and also organized many conferences as secretary, organizer and committee members.

Title： Bubble dynamics in gas fluidization of nonspherical particles.

Abstract：

Bubbling fluidized beds (BFB) have widespread applications in various industrial process because they have excellent features such as high chemical conversion, heat and mass transfer and mixing. Bubbles generated are generally regarded as the driving force influencing the performance and efficiency of BFB. Several variables can affect the bubble dynamics such as fluidization gas velocity, particle shape, inter-particle force, etc. Understanding the effect of these variables is of paramount importance to the improvement of design, operation and control of BFB. In this presentation, the aim is to report how the particle shape affects bubble dynamics under via numerical simulation under different conditions. Ellipsoidal particles are used as they have unique advantage in representing a quite range of particle shapes varying from disc-like to rod-like. The

results reveal that for the case of continuous single jet, particle shape can alter the mechanisms of bubble behavior such as splitting and coalescence. Ellipsoids have larger bubble equivalent diameters, more irregular bubble shape, and lower bubble frequency and bubble velocities. For the case of uniform BFB, the results show that bubble flow patterns for ellipsoids are asymmetric leading to different solid flow pattern, solid mass flux, and mixing characteristics in the whole bed. The ellipsoids have a smaller bubble size and lower bubble rising velocity than spheres. The combined effects of particle shape and van der Waals force on bubble dynamics are also examined. It is found that the bubble coalescence and splitting phenomena are suppressed with the increase of van der Waals force. The bubble diameter and velocity decrease with the increase in extent of van der Waals force for particle of different shapes. Moreover, the oblate/prolate spheroids transform to non-bubbling fluidization under the influence of high cohesive force while spheres form channels.

5. Detailed meeting schedule

5.1 Opening ceremony

Reporting time: July 28, 2022　14:20-18:30 pm (China Time)

Zoom Meeting No: 865 8269 4501 (Password:186948)

Koushare Meeting link: https://www.koushare.com/lives/room/833966

Opening ceremony Chair：Bofeng Bai Tassos G. Karayiannis Aibing Yu		
14:20-14:50	Leader's speech	
14:50-15:30	Plenary lecture	Effect of Steam Velocity during Dropwise Condensation Davide Del Col University of Padova, Padua, Italy
15:30-16:10	Plenary lecture	Boiling and Bubbles Dynamics from Artificial Nucleation Sites Khellil Sefiane University of Edinburgh, Edinburgh, UK
16:10-16:30	Coffee Break	
16:30-17:10	Plenary lecture	From Fundamentals to Industrial Applications Opportunities and Challenges Raffaella Ocone Heriot-Watt University, UK
17:10-17:50	Plenary lecture	Composite Phase Change Materials for Heating and Cooling Decarbonisation Yulong Ding University of Birmingham, Birmingham City, UK
17:50-18:30	Plenary lecture	Feedback and Optimal Control of Falling Film Flows Demetrios Papageorgiou Imperial College London, London, UK

5.2 Breakout session reports

Session 1
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Atsuki Komiya

Reporting time: July 28, 2022 8:30-11:40 am (China Time)

Zoom Meeting No: 924 6287 3469 (Password:864067)
Koushare Meeting link: https://www.koushare.com/lives/room/331118

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220265	Jet Dynamics and Complex Phase Behaviors of Supercritical CO_2 Lin Chen Institute of Engineering Thermophysics, Chinese Academy of Sciences, China
09:00-09:20	220103	Distinct Regimes for Flow Dynamics of Supercritical CO_2-Water Displacement Through Micromodels with Elliptic Cross Section Karim Ragui, Mengshuai Chen, Jiaxiang Chen, Yongchang Feng, Lin Chen* Institute of Engineering Thermophysics, Chinese Academy of Sciences, China
09:20-09:40	220063	Catalytic hydrogenation of biomass-derived materials in supercritical CO_2-ionic liquid systems Haixin Guo*, Yuta Hirosaki, Richard Lee. Smith, Jr. Agro-Environmental Protection Institute, Ministry of Agriculture and Rural Affairs, China
09:40-10:00	220105	Quantitative Analysis of Transient Near-Critical Boundary Heat Transfer Behaviors by Pixelated Phase-Shifting Interferometry Yizhi Zhang, Dong Yang, Jinguang Zang, Yanping Huang, Lin Chen* Institute of Engineering Thermophysics, Chinese Academy of Sciences, China
10:00-10:20	Coffee Break	
10:20-10:40	220104	Visualization of Phase Mixing and Equilibrium Process in Trans-/Supercritical Conditions Dong Yang, Lin Chen* Institute of Engineering Thermophysics, Chinese Academy of Sciences, China
10:40-11:00	220094	Thermal Performance in Printed Circuit Heat Exchangers with Boiling Condition in a Combined SCO_2 Brayton Cycle Huaitao Zhu, Gongnan Xie*

		Northwestern Polytechnical Universitys, China
11:00-11:20	220129	Micro segment analysis of supercritical methane thermal-hydraulic performance in a PCHE straight channel Qian Li, Zijie Lin, Qi Zhan, Weihua Cai* Northeast Electric Power University, China
11:20-11:40	220102	Effects of Pore Structure on Supercritical CO_2 Thermal Convection in Porous Media Yongchang Feng, Lin Chen*, Yuki Kanda, Atsuki Komiya Institute of Engineering Thermophysics, Chinese Academy of Sciences, China

Session 2
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Xiaonan Wang

Reporting time: July 28, 2022 8:30-11:40 am (China Time)

Zoom Meeting No: 927 9681 4545 (Password:909964)
Koushare Meeting link: https://www.koushare.com/lives/room/240190

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220061	Application of three-dimensional full-loop CFD simulation in CFBs Qiuya Tu Chinese Academy of Sciences Institute of Engineering Thermophysics, China
09:00-09:20	220287	Eduardo Pereya The University of Tulsa, USA
09:20-09:40	220263	Dynamically ordered meso-scale structures in vibrated gas-fluidized beds Qiang Guo Columbia University, USA
09:40-10:00	220045	Fluid flow in nanochannels driven by condensation-evaporation phase transitions Runfeng Zhou, Chengzhen Sun*, Bofeng Bai Xi'an Jiaotong University, China
10:00-10:20	Coffee Break	
10:20-10:40	220054	Predictive Method for Flow Condensation Heat Transfer in Plain Channels Xiande Fang*, Xiaohuan Li, Zufen Luo Nanjing University of Aeronautics and Astronautics, China

10:40-11:00	220087	Numerical simulation on heat transfer characteristics of detached bubble of unstable steam jet Jingyu Li, Yuelin Mo, Qi Xiao, Yong Li, Shilin Song, Weixiong Chen*, Daotong Chong, Junjie Yan Xi'an Jiaotong University, China
11:00-11:20	220083	Numerical investigation of flow and heat transfer of supercritical carbon dioxide in the vertical helically-coiled tube under half-side heating condition Sen Zhang, Xiaohong Hao University of Shanghai for science and technology, China
11:20-11:40	220048	Diffusion characteristics of ions through two-dimensional nanopores Dong Wei, Runfeng Zhou, Chengzhen Sun*, Bofeng Bai Xi'an Jiaotong University, China

Session 3
Room Organic waste conversion and utilization（Topic 8）
Chairman: Shuai Wang

Reporting time: July 28, 2022　8:30-11:40 am (China Time)

Zoom Meeting No: 970 0600 1020 (Password:666888)
Koushare Meeting link: https://www.koushare.com/lives/room/602909

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220266	The kinetics regulation of photo-generated carriers in g-C3N4 by bulk/surface engineering towards high-efficiency photocatalytic H2 production Jinwen Shi, Yazhou Zhang, Cheng Cheng Xi'an Jiaotong University, China
09:00-09:20	220138	Electrowetting based self-powered liquid actuators Dongyue Jiang
09:20-09:40	220139	Thermalhydraulic optimization of microchannel heat-sink with carbon-dioxide at supercritical pressure Nitesh Kumar*, Dipankar N. Basu Department of Mechanical Engineering, IIT Guwahati, India
09:40-10:00	220149	Biomass-based PCM from daisy stem and paraffin for building thermal management Chongwei Wang, Tingxiang Jin* Zhengzhou University of Light Industry, China
10:00-10:20	Coffee Break	
10:20-10:40	220151	An aqueous redox flow battery with long life by using a novel copper complex Cu[HCOO]3[NH3CH3] as negative active substance

		Ying Yang*, Binglan Wu, Chongrong Yang, Shudi Li, Jiahui Liu, Jinlong Li, Hui Ji Northwest University, China.
10:40-11:00	220164	Biomechanical mechanism of distal stent-graft-induced new entry deterioration after thoracic endovascular aortic repair Yonghui Qiao, Kun Luo, Jianren Fan Zhejiang University, China
11:00-11:20	220176	Influence of droplet size ratio on stretching separation regime during binary collision Jingqi Bu, Shenghui Zhong, Zhuoxin Liu, Ning Han, Xifeng Liao, Kui Jiao, Fan Zhang*, Qing Du* Tianjin University, Tianjin, China
11:20-11:40		

Session 4
Room Modeling and numerical methodologies（Topic 4）
Chairman: Min Xiang

Reporting time: July 28, 2022　8:30-12:00 am (China Time)

Zoom Meeting No: 938 9669 8273 (Password:618486)
Koushare Meeting link: https://www.koushare.com/lives/room/074632

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220267	Interaction mechanism between a ventilated supercavity with exhausted hot gas MinXiang National University of Defense Technology, China
09:00-09:20	220095	Numerical study of gas-solid flow characteristics of cylindrical bubbling fluidized bed by CFD-DEM with periodic boundary conditions Tang Zhong, Li Zhenzhong*, Yang Chen* Key Laboratory of Low-grade Energy Utilization Technologies and Systems (Chongqing University), China
09:20-09:40	220202	Thermophysical properties and condensation of R514A through Molecular Dynamics Simulation method Misbah Khan, Jian Wen1* Xi’ an Jiaotong University, China
09:40-10:00	220270	Effect of ambient wind on the performance of Natural Draft Direct Air-cooling System Yunfen Yang, Hongfang Gu*, Jie Wang, Jialu Yu Xi'an Jiaotong University, China
10:00-10:20	Coffee Break	

10:20-10:40	220183	Evaluation of frictional pressure drop correlations for gas-liquid two-phase flow in pipeline-riser system Nailiang Li*, Bin Chen, Xueping Du China University of Mining and Technology, China
10:40-11:00	220195	Phase Transitions of Yukawa Liquids in the Electric Field using Molecular Dynamics Simulations Muhammad Asif Shakoori, Maogang He*, Aamir Shahzad Xi'an Jiaotong University, China
11:00-11:20	220016	On-line identification of gas-liquid two-phase flow pattern in riser system with long distance horizontal pipeline Haiyang Yu, Qiang xu, Liejin Guo Xi’ an Jiaotong University, China
11:20-11:40	220222	Three-dimensional dynamics of a single bubble rising near a vertical wall: paths and wakes Hongjie Yan, Heyang Zhang, Huimin Zhang, Liu Liu* Central South University, Changsha, 410083, China
11:40-12:00	220091	Investigation of Dust Lifting by a Moving Shock Wave Based on Compressible Multiphase Particle-in-Cell Method Jiahui He, Baoqing Meng, Jiangling Li*, Baolin Tian Northwestern Polytechnical University, China

Session 5
Room Measurement and instrumentation（Topic 5）
Chairman: Zongyan Zhou

Reporting time: July 28, 2022　8:30-11:40 am (China Time)

Zoom Meeting No: 987 6477 2100 (Password:823168)
Koushare Meeting link: https://www.koushare.com/lives/room/478671

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220268	Wire-mesh sensors: principles and applications for multiphase flow monitoring Marco Jose da Silva Federal University of Technology-Parana, Brazil
09:00-09:20	220180	Algorithm research of oil-water two-phase mixed interface identification in horizontal well based on array flow image Junfeng Liu1, Huimin Zhou1, Shuaifei Cui1, Zhu Bo2, Luo Weidong Key Laboratory of Exploration Technologies for Oil and Gas Resources (Yangtze University), China
09:20-09:40	220237	Submerged Reacting Gas Jet from the Laval Nozzle into Liquid Xing Li, Fangchen Xue, Bofeng Bai*

		Xi’ an Jiaotong University, China
09:40-10:00	220090	Review on the study of theory and method of electrical capacitance tomography of cryogenics propellant Xinxin Gao, Zenan Tian, Xiaobin Zhang* Zhejiang University, China
10:00-10:20	Coffee Break	
10:20-10:40	220135	The rotation of a composite porous particle in 2D simple shear flow with inertia Zhitao Li, Gui Lu, Liang Wang North China Electric Power University, China
10:40-11:00	220146	Configuration optimization of optical tomography system based on genetic algorithm Huajun Li*, Xiaozhao Zheng, Guangyu Liu, Shanen Yu Hanghzhou Dianzi University, China
11:00-11:20	220038	Analysis of gas distribution in centrifugal pump based on CFD-PBM model in high IGVF Xiaobin Su, Qiang Xu, Liang Chang, Chenyu Yang, Liejin Guo* Xi'an Jiaotong University, China
11:20-11:40	220232	Experimental study on micro-explosion of emulsified fuel droplets heated by laser Houpeng Zhang, Zhen Lu, Tianyou Wang, Zhizhao Che* Tianjin University, China

Session 6
Room Multiphase flow in industrial process（Topic 6）
Chairman: Wu Zhou

Reporting time: July 28, 2022　8:30-11:40 am (China Time)

Zoom Meeting No: 978 3162 9384 (Password:996326)
Koushare Meeting link: https://www.koushare.com/lives/room/336666

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220269	Phase change materials for energy-efficient thermal comfort control of buildings Shuang Cui Engineering, University of Texas at Dallas, USA
09:00-09:20	220027	Progress on cryogenic chill-down in the exit-contracted pipes Jiaqi Zhang National University of Defense Technology, China
09:20-09:40	220046	Hybrid Membranes of Graphene Oxide for Nanofluidic Osmotic Power Generation

		Xinyi Ma, Chengzhen Sun*, Bofeng Bai Xi'an Jiaotong University, China
09:40-10:00	220075	Preparation and research of lauric acid-palmitic acid-tetradecanol/expanded vermiculite composite phase change material and its gypsum-based building materials Huo Yujia, Feng Zhao, Luo Jieren, Yan Qiuhui* Xi'an University of Architecture and Technology, China
10:00-10:20	Coffee Break	
10:20-10:40	220086	CFD simulation and analysis of liquid flow in an ironmaking blast furnace with consideration of liquid viscosity and packing properties Yancong Liu, Lulu Jiao, Shibo Kuang, Aibing Yu Monash University, Australia
10:40-11:00	220119	DEM-VOF simulations on the non-spherical particles at free surface in stirred tanks Zhengquan Li, Yongchang Sun Jiangxi University of Science and Technology, China
11:00-11:20	220047	Molecular Simulations of Two-Phase Imbibition of Water-Oil Displacement in Nanochannels Keteng Tang, Runfeng Zhou, Chengzhen Sun*, Bofeng Bai Xi'an Jiaotong University, China
11:20-11:40	220125	Numerical modeling and analysis of particle-fluid flow and wall erosion characteristics in centrifugal slurry pump Haoyu Wang, Shibo Kuang, Aibing Yu Monash University, Australia

Session 7
Room Reactive multiphase flow
Resource exploitation (rare-earth, oil & gas)（Topic 3&7）
Chairman: Jing Li

Reporting time: July 28, 2022 8:30-11:40 am (China Time)

Zoom Meeting No: 927 7402 9148 (Password:548141)
Koushare Meeting link: https://www.koushare.com/lives/room/575628

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220005	Data-driven analytics to inform forces and torques in particle-laden flows Litao Zhu Shanghai Jiao Tong University, China
09:00-09:20	220071	Simulation study on flow behaviors of sand-containing hydrate slurry in

		pipes Shangfei Song, Xuetong Li, Bohui Shi*, Haotian Liu, Qingyun Liao, Xu Duan, Lihao Liu, Jing Gong* China University of Petroleum-Beijing, China
09:20-09:40	220288	Modeling of High-Temperature Oxidation in a Moving-Bed Reactor for Thermochemical Energy Storage David Korba, Like Li Department of Mechanical Engineering, Mississippi State University, USA; Mississippi State University, USA
09:40-10:00	220128	Investigating the influence of suspended particles on plugging efficiency in fracture-cavity reservoir using DEM-CFD coupling method Chao Zhang, Mengxi Li, Weijie Yan* Shandong Jianzhu University, China
10:00-10:20	Coffee Break	
10:20-10:40	220173	Mechanism underlying hydrate blockage in multiphase flow: Experimental investigation and machine learning prediction Jiguang Wang, Yang Meng, Bingyue Han, Chen Lang, Lunxiang Zhang* Dalian University of Technology, China
10:40-11:00	220246	Experimental study on catalysis of reservoir inorganic minerals in heavy oil upgrading by supercritical water Lichen Zheng, Qiuyang Zhao, Yu Dong, Hui Jin, Bawaa Baercheng, Liejin Guo* Xian Jiaotong University, China
11:00-11:20	220126	CFD-DEM investigation on sand screen performance: Effect of fluid rheology Noor Ilyana Ismail, Shibo Kuang, Aibing Yu Monash University, Australia
11:20-11:40	220224	Calculation method of atomization evaporation time of desulfurization wastewater in flue YU Jia-lu，GU Hong-fang，YANG Yun-fen，LIU Xi-yong,，LI Bing-jie Xi'an Jiaotong University, China

Session 8
Room Multiphase flow and heat transfer
Organic waste conversion and utilization（Topic 2&8）
Chairman: Yaning Zhang

Reporting time: July 28, 2022 8:30-11:40 am (China Time)

Zoom Meeting No: 982 1082 5736 (Password:252799)
Koushare Meeting link: https://www.koushare.com/lives/room/942637

Time	Article No.	Title Authors The first unit of the authors
08:30-09:00	Keynote 220272	Flow regimes in the transport zone of large-scale CFB combustor Jianhang Hu Kunming University of Science and Technology, China
09:00-09:20	220057	Developing a compact heat exchange structure for a thermoelectricity conversion system Licheng Sun*, Heping Xie, Xiting Long, Jun Wang, Cunbao Li, Zafar Hayat Khan, Zhengyu Mo Sichuan University, China
09:20-09:40	220068	Two-phase Flow Regime in A Super Long Gravity Heat Pipe for Deep Geothermal Energy Extraction Tianyi Gao, Heping Xie1*, Licheng Sun*, Xiting Long, Jun Wang, Cunbao Li, Mingzhong Gao, Entong Xia Sichuan University, China
09:40-10:00	220030	Experimental investigation on hydrothermal liquefaction of polymer-containing oily sludge： Products distribution and elements migration Pai Peng; Gaoyun Wang; Linhu Li; Hui Ge; Hui Jin; Liejin Guo* Xian Jiaotong University, China
10:00-10:20	Coffee Break	
10:20-10:40	220070	A modular design of thermoelectric stack with TEGs towards large-scale utilization Entong Xia, Heping Xie*, Licheng Sun*, Xiting Long, Jun Wang, Cunbao Li, Mingzhong Gao, Tianyi Gao Sichuan University, China
10:40-11:00	220235	Effect of porous coating on falling film flow and heat transfer over horizontal tubes Jing-Dong Wu, Chuang-Yao Zhao* Xi'an University of Architecture and Technology, China
11:00-11:20	220088	Flow Rate Prediction in Gas/oil/water Flows Based on ERT-EMF Measurement System Lei Jiang, Haifeng Zhang, Maomao Zhang, Yi Li Tsinghua University in Shenzhen International Granulation School, China
11:20-11:40		

July 28, 2022 14:20-18:30 pm

Reporting time: July 28, 2022 14:20-18:30 am (China Time)

Zoom Meeting No: 865 8269 4501 (Password:186948)

Koushare Meeting link: https://www.koushare.com/lives/room/833966

Opening ceremony Chair： Bofeng Bai Tassos G. Karayiannis Aibing Yu		
14:20-14:50	Leader's speech	
14:50-15:30	Plenary lecture	Effect of Steam Velocity during Dropwise Condensation Davide Del Col University of Padova, Padua, Italy
15:30-16:10	Plenary lecture	Boiling and Bubbles Dynamics from Artificial Nucleation Sites Khellil Sefiane University of Edinburgh, Edinburgh, UK
16:10-16:30	Coffee Break	
16:30-17:10	Plenary lecture	From Fundamentals to Industrial Applications Opportunities and Challenges Raffaella Ocone Heriot-Watt University, UK
17:10-17:50	Plenary lecture	Composite Phase Change Materials for Heating and Cooling Decarbonisation Yulong Ding University of Birmingham, Birmingham City, UK
17:50-18:30	Plenary lecture	Feedback and Optimal Control of Falling Film Flows Demetrios Papageorgiou Imperial College London, London, UK

July 29, 2022　08:00-12:10 am

Reporting time: July 29, 2022　8:30-11:40 am (China Time)

Zoom Meeting No: 865 8269 4501 (Password:186948)

Koushare Meeting link: https://www.koushare.com/lives/room/833966

Chairman:Xiaoshu Cai		
08:00-08:40	Plenary lecture	Numerical Simulations of Complex Multiphase Flows Gretar Tryggvason Johns Hopkins University, Baltimore, USA
08:40-09:20	Plenary lecture	Liquid Film Characteristics during Horizontal Annular Flows for In-Tube Evaporation and Condensation Gherhardt Ribatski University of São Paulo (USP), Brazil
09:20-10:00	Plenary lecture	Pseudo-Phase Change Theory and Applications for Supercritical Fluids Jinliang Xu North China Electric Power University, China
10:00-10:20	Coffee Break	

Session 9
Room Hydrogen production and utilization（Topic 9）
Chairman:　Haigang Wang

Reporting time: July 29, 2022　10:20-12:10 am (China Time)

Zoom Meeting No: 961 9204 3941 (Password:321083)

Koushare Meeting link: https://www.koushare.com/lives/room/615647

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220006	Smart energy transitions towards a carbon-neutral future Xiaonan Wang Tsinghua University, China
10:50-11:10	220260	A molecular dynamics simulation study on the diffusion coefficient of ·H, ·OH, ·C6H5 and different radicals in supercritical water

		Weijing Ding, Hui Jin*, Osamu Takahashi*, Liejin Guo Xian JiaoTong University, China
11:10-11:30	220085	Numerical investigation of ironmaking blast furnace with simultaneous injection of hydrogen through shaft and hearth tuyeres Jing Li, Shibo Kuang, Ruiping Zou, Aibing Yu Monash University, Australia
11:30-11:50	220111	Design and mechanism of two-dimensional h-BN/SiC composite heterojunction photocatalyst Chenglin Zheng, Zhengquan Li Jiangxi University of Science and Technology, China
11:50-12:10		

Session 10
Room Low carbon technology and new energy（Topic 10）
Chairman: Qiuya Tu

Reporting time: July 29, 2022　10:20-12:10 am (China Time)

Zoom Meeting No: 972 0383 7723 (Password:908999)

Koushare Meeting link:https://www.koushare.com/lives/room/550622

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220273	Discrete element simulation of dense gas-solid reacting flow Shuai Wang Unversity of New South Wales, Australia
10:50-11:10	220289	Non-intrusive multimodal sensing for pool boiling characterization Han Hu University of Arkansas, USA
11:10-11:30	220148	Study on thermodynamic optimization of supercritical CO2 cycle system for new energy Jiaqi Feng, Bofeng Bai Xi'an Jiaotong University, China
11:30-11:50	220157	Parametric study of geothermal-SOFC combined system based on ORC-TEG waste heat recovery Guokun Liu, Dongxu Ji Chinese University of Hong Kong (Shenzhen), China
11:50-12:10	220160	Optimization design and numerical analysis of cooling plate for battery thermal management based on multi-objective topology optimization Ya-Song Sun, Rui-Huai Bai Northwestern Polytechnical University, China

Session 11
Room Interdisciplinary multiphase flow (medicine, bionic, ...)（Topic 11）
Chairman: Jingwei Chen

Reporting time: July 29, 2022 10:20-12:10 am (China Time)

Zoom Meeting No: 967 4317 8876 (Password:863301)

Koushare Meeting link: https://www.koushare.com/lives/room/509967

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220013	Bubble dynamics in gas fluidization of nonspherical particles Zongyan Zhou Jiangxi University of Science and Technology, China
10:50-11:10	220096	Multi-objective optimization of hydrocyclone by integrated CFD and AI models Qing Ye, Peibo Duan, Shibo Kuang, Ruiping Zou, Aibing Yu Monash University, Australia
11:10-11:30	220192	Gas venting analysis in battery module during thermal runaway process Peizhao LYU, Zhonghao RAO* Hebei University of Technology, China
11:30-11:50	220197	Measurement characteristics of cone flowmeter based on bionic non-smooth surface Acong Duan, Yangfei Shen, Denghui He*, Lefu Zhang Xi’an University of Technology, China
11:50-12:10	220204	Effects of the pore number and pore size of the vibrating plate on the deposition of nebulized droplets in a simplified mouth-throat airway model Jinan Zhang, Huang Yu, Xiaole Chen*, Huizhen Yang, Feng Tao, Baobin Sun Nanjing Normal University, China

Session 12
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Litao Zhu

Reporting time: July 29, 2022 10:20-12:10 am (China Time)

Zoom Meeting No: 996 8660 6051 (Password: 077329)

Koushare Meeting link: https://www.koushare.com/lives/room/683327

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220136	Aerodynamics-assisted, efficient and scalable kirigami fog collectors Jing Li Shanghai Jiaotong University, China
10:50-11:10	220141	Experimental Study on Flashing Front Propagation in Small Diameter Vertical Tube Shu-Wen Yue, Wang-Fang Du*, Jian-Fu Zhao University of Chinese Academy of Sciences, China.
11:10-11:30	220112	LES study of unsteady cloud cavitation mechanisms of liquid nitrogen in convergent-divergent nozzle Aibo Wei, Shunhao Wang, Lianyan Yu, Xiaobin Zhang* Zhejiang University, China
11:30-11:50	220117	Characteristic Analysis of Porous Structure of Cathode Deposited Copper Nian Xu, Xinyu Xu, Huaqiang Chu* Anhui University of Technology, China
11:50-12:10		

Session 13
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Sida Liu

Reporting time: July 29, 2022 10:20-12:10 am (China Time)

Zoom Meeting No: 985 3576 2811 (Password: 235615)

Koushare Meeting link: https://www.koushare.com/lives/room/417123

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220238	DEM Study of Particle Shape Effects on Hopper Flow in a Cylindrical Bin Sida Liu Jiangxi University of Science and Technology, China
10:50-11:10	220049	Flow Dynamics of Monolayer Water in Nano Slits Qiyuan Wang, Runfeng Zhou, Chengzhen Sun*, Bofeng Bai Xi'an Jiaotong University, China
11:10-11:30	220100	Enhanced subcooled flow boiling heat transfer of Leaf-vein-inspired open microchannel Qi Zhao, Xuemei Chen

		Nanjing University of Science and Technology, China
11:30-11:50	220114	Spatiotemporal evolution of the flow structures and the coolant coverage in double rows film cooling with the combination of forward and backward jets Yanqin Shangguan*, Fei Cao Hohai University, China
11:50-12:10	220089	Experimental and Numerical research of the influence of boundary on the supercritical water heat transfer characteristics in an inclined smooth tube Xiaocheng Du, Hao Qing, Lingfeng Bi, Haoyu Yang, Dong Yang*, Siyang Wang Xi'an Jiaotong University, China

Session 14
Room Reactive multiphase flow（Topic 3）
Chairman: Shiliang Yang

Reporting time: July 29, 2022　10:20-12:10 am (China Time)

Zoom Meeting No: 963 0315 2024 (Password: 121450)

Koushare Meeting link: https://www.koushare.com/lives/room/621158

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220134	Al-based metallic macrocapsule for high temperature phase change thermal storage Chunyu Zhu China University of Mining and Technology, China
10:50-11:10	220193	A new kinetic model for reactive particle evolution in multicomponent fluid Shuaiqi Zhao, Kunpeng Zhao, Rui Zhang and Bofeng Bai Xi'an Jiaotong University, China
11:10-11:30	220171	CPFD modeling of flow, combustion and NOx emission in an industrial CFB boiler Jian Chang, Xin Wang North China Electric Power University, China
11:30-11:50	220194	Morphology evolution of coal particles in supercritical water Rui Zhang, Kunpeng Zhao, Shuaiqi Zhao, Bofeng Bai Xi'an Jiaotong University, China
11:50-12:10	220200	The effects of particle preferential concentration on pulverized coal ignition and combustion process using direct numerical simulation Guo Chen, Haiou Wang*, Kun Luo, Jianren Fan

		Zhejiang University, China

Session 15
Room Modeling and numerical methodologies（Topic 4）
Chairman: Sherman Cheung

Reporting time: July 29, 2022 10:20-12:10 am (China Time)

Zoom Meeting No: 923 3639 8625 (Password: 686314)

Koushare Meeting link: https://www.koushare.com/lives/room/560359

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220069	Theoretical, Experimental and Numerical Investigations on Movement and Heat Transfer Mechanisms of Non-spherical Particles in Blast Furnace Raceway Hao Zhang Northeastern University, China
10:50-11:10	220097	A bubble-based drag model of rough sphere for the simulation of bubbling fluidized bed Weijie Yin, Shuai Wang Harbin Institute of Technology, China
11:10-11:30	220142	Numerical study on distribution characteristics of salt crystals in a supercritical water fluidized bed reactor: Effect of aggregation and breakage Xujun Li, Gaoyun Wang, Kaicheng Chen, Hui Jin, Liejin Guo* Xi'an Jiaotong University, China
11:30-11:50	220144	Numerical simulation of flame complex permittivity distribution based on model considering positive ions and electrons Chao Wang, Shuo Jin, Zhizhuo Zhen, Xiaoning Cao, Jiamin Ye* Tianjin University, China
11:50-12:10	220153	Investigation on effect of drag models on flow behavior of power-law fluid-solid two-phase flow in fluidized bed Zihan Yuan, Shuyan Wang*, Lei Xie, Xi Chen, Baoli Shao Northeast Petroleum University,, China

Session 16
Room Measurement and instrumentation（Topic 5）
Chairman: Zhonghao Rao

Reporting time: July 29, 2022 10:20-12:10 am (China Time)

Zoom Meeting No: 928 8740 2267 (Password: 410419)

Koushare Meeting link: https://www.koushare.com/lives/room/666520

Time	Article No.	Title Authors The first unit of the authors
10:20-10:50	Keynote 220257	A Lattice Boltzmann Method for multiphase flows with heat transfer Toshio Tagawa Tokyo Metropolitan University, Japan
10:50-11:10	220248	The spraying characteristics of the ethanol in the simple-jet regime with needle-plated electrode Qian Kong, Zhentao Wang*, Bin Li, Kai Yu, Huibin Xu Jiangsu University, China
11:10-11:30	220187	Flow Pattern Identification of Gas-Liquid Two-Phase Flow Based on a CCERT system with Density Peaks Clustering Xintong Fang, Yandan Jiang, Haifeng Ji, Baoliang Wang, Zhiyao Huang Zhejiang University, China
11:30-11:50	220213	Flowrate measurement of vertical oil-gas-water slug flow based on thermal diffusion Wei Guo*, Li Wang, Chuanping Liu, Lige Tong, Fulin Kong University of Science and Technology Beijing, China
11:50-12:10	220215	Gas-liquid two-phase flow rates measurement using physics-guided deep learning Shanshan Li, Bofeng Bai* Xi'an Jiaotong University, China

July 29, 2022 14:30-18:00 pm

Session 17
Room Multiphase flow in industrial process（Topic 6）
Chairman: Pavel Skripov

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No: 966 8421 1833 (Password: 400162)

Koushare Meeting link: https://www.koushare.com/lives/room/885782

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220067	Heat transfer by not fully stable fluids: key findings Pavel Skripov

		Russian Academy of Sciences, Russia
15:00-15:20	220106	Numerical Investigation of Pool Boiling Heat Transfer Enhancement through Surface Modifications using the Lattice Boltzmann method Aritra Mukherjee, Lin Chen*, Dipankar N. Basu Indian Institute of Technology Guwahati, India
15:20-15:40	220079	Optical Visualization of Heat Transfer in Supercritical Carbon Dioxide under Conditions of Near and Far from The Critical Point Yuki Kanda, Lin Chen, Atsuki Komiya Tohoku University, Japan
15:40-16:00	220060	Model of unsteady pulse heat transfer for a fluid near a critical point Alexey Melkikh, Pavel Skripov Russian Academy of Sciences, Russia
16:00-16:20	220107	Interfacial Instability Analysis of Subcritical and Supercritical CO_2 Phase Mixing Tabish Wahidi, Lin Chen* National Institute of Technology Karnataka, India
16:20-16:40	Coffee Break	
16:40-17:00	220074	Supercritical transition at small times, sizes and high thermal loads Alexander Igolnikov, Sergey Rutin Russian Academy of Sciences, Russia
17:00-17:20	220159	Research on the performance of low-quality steam gas wave booster Luwei Zhang, Yuqiang Dai, Congcong Lv Dalian University of Technology, China
17:20-17:40	220179	Rotordynamic characteristics of scallop damper seal for Supercritical CO_2 turbomachinery Enbo Zhang, Zitian Lai, Bofeng Bai* Xi'an Jiaotong University, China
17:40-18:00	220113	Heat Transfer Characteristics of Supercritical CO_2 in a Tapered Cylindrical Annular Channel Ashok Kumar Gond, Dipankar Narayan Basu, Amaresh Dalal Indian Institute of Technology Guwahati, India

Session 18
Room Resource exploitation (rare-earth, oil & gas)（Topic 7）
Chairman: Jun Yao

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No: 926 4433 2505 (Password: 112779)

Koushare Meeting link: https://www.koushare.com/lives/room/930964

Time	Article No.	Title Authors

		The first unit of the authors
14:30-15:00	Keynote 220011	Density segregation of granular materials in vibrated gas-fluidized bed (coarse-graining DEM-CFD and experimental investigations) Takuya Tsuji Osaka University, Japan
15:00-15:20	220230	Characterising the dispersed phase hydrodynamics in Pulsed Sieve-plate Extraction Columns Alex Fells, Frans Muller, Bruce Hanson University of Leeds, UK
15:20-15:40	220231	Coarse-grained discrete element method for granular shear flow Hideya Nakamura Osaka Prefecture University, Japan
15:40-16:00	220229	Utilization of Acoustic Backscatter Systems for Remote Analysis of Complex Mineral Suspensions in Engineered Pipelines Serish Tanya Hussain, Timothy Hunter, Jeff Peakall, Hugh Rice and Martyn Barnes University of Leeds, UK
16:00-16:20	220029	Numerical investigation of the electrostatic effect on particle transport in a 90° bend Yudong Yan, Yanlin Zhao*, Min Liu, Jun Yao China University of Petroleum, China
16:20-16:40	Coffee Break	
16:40-17:00	220028	Particle deposition in a duct with flat sediment bed Min Liu, Yanlin Zhao*, Yudong Yan, Jun Yao, Michael Fairweather China University of Petroleum, China
17:00-17:20	220066	Investigation of the Hydrodynamic Characteristics of Spouted Fluidized Beds using Pressure Fluctuation Signals and Electrical Capacitance Tomography Zaixing Liu, Haigang Wang Chinese Academy of Sciences Institute of Engineering Thermophysics, China
17:20-17:40	220036	Methodology of predicting DNB for the plasma facing component in fusion reactor Kecheng Jiang Chinese Academy of Sciences,China
17:40-18:00	220249	Experimental investigation on subcritical water conversion of oil shale for oil and gas Tian Xie, Qiuyang Zhao, Hui Jin, Liejin Guo* Xian Jiaotong University, China

Session 19
Room Organic waste conversion and utilization（Topic 8）

Chairman: Qingang Xiong

Reporting time: July 29, 2022 14:30-18:00 pm (China Time)

Zoom Meeting No: 921 2202 5292 (Password: 181715)

Koushare Meeting link: https://www.koushare.com/lives/room/225067

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220008	An analytical/semi-analytical framework for modeling the multi-phase flow problems in biomass thermochemical conversions Fei Xu Ansys, Inc, USA
15:00-15:20	220290	Yacine Addad Khalifa University, UAE
15:20-15:40	220291	Rehan Zubair Pakistan Institute of Engineering and Applied Sciences, Pakistan
15:40-16:00	220292	James Ferri Virginia Commonwealth University, USA
16:00-16:20	220042	A Laser speckle contrast imaging method based on anisotropic diffusion filtering Xuehao Sang, Xu Sang, Dong Li, Bin Chen* Xi'an Jiao tong University, China
16:20-16:40	Coffee Break	
16:40-17:00	220258	Numerical Study of Dry Reforming of Methane in Packed & Fluidized Beds Fahad Al-Otaibi, Hongliang Xiao, Abdallah Berrouk* Khalifa University, UAE
17:00-17:20	220262	Numerical and experimental study of gas – particle reaction in a fluidized-bed reactor for thermochemical heat storage Hangbin Zheng, Xianglei Liu Nanjing University of Aeronautics and Astronautics, China
17:20-17:40	220064	Experimental and numerical study of extracting silver from end-of-life solar cells in rotating systems Yuanhe Yue, Yansong Shen Unversity of New South Wales, Australia
17:40-18:00	220050	Identification of flow regimes in a long pipeline-riser system with pressure signals Xinyu Wang, Chenying Liu, Qimeng Liu, Yonglu She, Qiang Xu* Xi'an Jiao tong University, China

Session 20
Room Multiphase Flow and Heat Transfer（Topic 2）
Chairman: Junbing Xiao
Libor Pekař

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No: 978 4069 6368 (Password: 818015)

Koushare Meeting link: https://www.koushare.com/lives/room/823415

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220058	On the identification and robust control of a delayed heat-exchanger process Libor Pekař Tomas Bata University in Zlín, Czech Republic
15:00-15:20	220122	Design and mechanism of two-dimensional h-BN/SiC composite heterojunction photocatalyst Chenglin Zheng, Zhengquan Li Jiangxi University of Science and Technology, China
15:20-15:40	220123	Experimental study of a humidification-dehumidification seawater desalination system combined with the vacuum tube solar collectors: system development and techno-economic evaluation Fei Cao*, Xianzhe Gu, Hao Wu, Yanqin Shangguan Hohai University, China
15:40-16:00	220165	The oxygen migration in near-surface models and the effects of A-site doping Yuan Feng, Guohui Gao, Shuai Wang Harbin Institute of Technology, China
16:00-16:20	220184	System design and integration for electrified steam methane reforming with LNG cold utilization Huchao Song, Xiaolong Lin, Mengfei Shen, Hao Bian, Yinhe Liu* Xi'an Jiaotong University, China
16:20-16:40	Coffee Break	
16:40-17:00	220189	bubble-less hydrogen evolution enabled by rose-petal mimetic electrode design Kai Deng, Hao Feng, Ying Zhang, Yuhao Tian, Dong Liu, Qiang Li Nanjing University of Science and Technology, China
17:00-17:20	220205	Modeling of ammonia/hydrogen combustion in porous media Shini Lai, Danan Chen, Jun Li*, Hongyu Huang, Noriyuki Kobayashi Chinese Academy of Sciences, Guangzhou, 510640, China

17:20-17:40	220207	Plasmonic electron transfer and phonons in plasmonic metal/semiconductors photocatalysts Ying Zhang‖, Xinyue Chen‖, Hao Feng, Dong Liu* Nanjing University of Science and Technology, Nanjing 210094, China
17:40-18:00	220211	The near-field flow structures of under-expanded cryogenic hydrogen jets Zhaoxin Ren Swansea University, UK

Session 21
Room Low carbon technology and new energy（Topic 10）
Chairman: Haitao Hu
Huasheng Wang

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No: 939 9402 0711 (Password: 990500)

Koushare Meeting link: https://www.koushare.com/lives/room/141886

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220274	Condensation of zerotropic mixture refrigerants Hua Sheng Wang School of Engineering and Materials Science, UK
15:00-15:20	220098	Research on Shell-side Multi-species Phase Change Heat and Mass Transfer in LNG Spiral-wound Heat Exchanger Xueping Du, Zhijie Chen, Yacheng Xu, Qi Meng China University of Mining Technology, China
15:20-15:40	220234	CFD Simulation of Falling Film Dehumidification on the Corrugated Plate Peng Zhang, Chuang-Yao Zhao* Xi'an University of Architecture and Technology, China
15:40-16:00	220240	Shell-side flow pattern analysis of floating LNG spiral wound heat exchanger, Corresponding Peidong Wang, Gongshu Wu, Yanjun Wu, Yan Ren*, Weihua Cai* University of Shanghai for Science and Technology, China
16:00-16:20	220108	Variation of Shell Side Heat Transfer Coefficient of Coil Wounded Heat Exchanger with Different Inlet Conditions Peiyuan Xu, Lin Chen*, Jiaxiang Chen, Yongchang Feng, Deqing Mei, Xiaohui Zhang, Xiaoguang Mi, Jie Chen Institute of Engineering Thermophysics, Chinese Academy of Sciences, China

16:20-16:40	Coffee Break	
16:40-17:00	220076	Condensation heat transfer characteristics of mixed refrigerant in spiral tube Zhongyun Tian, Wenke Zheng, Liwen Zheng, Jiwei Guo, Yiqiang Jiang Harbin Institute of Technology, China
17:00-17:20	220169	Correlation of phase separation conversion model for predicting frictional pressure drop of condensing two-phase flow in horizontal circular tubes Fang Xianshi, Cai Weihua, Qiu Guodong, Li Xiang Northeast Electric Power University, China
17:20-17:40	220132	The improvement of temperature distribution of the tubular solid oxide fuel cell fueled by biomass syngas by flow channel design Pengfei Zhu, Zhen Wu*, Zaoxiao Zhang Xi’ an Jiaotong University, China
17:40-18:00	220271	Application of multi-scale particle modelling for the next generation energy storage technique Ruihuan Ge The University of Sheffield, UK

Session 22
Room Organic Waste Conversion and Utilization （Topic 8）
Chairman: Kai Zhang

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No: 945 0028 5480 (Password: 134565)

Koushare Meeting link: https://www.koushare.com/lives/room/839639

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220010	The use of ultrasonics for online characterisation of multiphase suspension flows and separation: Applications in nuclear waste processing Timothy Hunter University of Leeds, UK
15:00-15:20	220293	Patrick Mountapmbeme Kouotou University of Marua, Cameroon
15:20-15:40	220294	Achraf El Kasmi Tangier University, Morocco
15:40-16:00	220206	Numerical analysis on drying characteristics of shiitake mushroom

		under variable-temperature convective drying Lizhe Zhang, Long Jiang, Xuejun Zhang Zhejiang University, China
16:00-16:20	220214	Excess Sludge disintegration using a CFB of Exploratory ExperimentLiang Dong，Tong Zhao*，Yahui Cui，Chaofan Pang Xi’an University of Technology, China
16:20-16:40	Coffee Break	
16:40-17:00	220120	Pinning and its Role in the Directed Motion of Fluids Panagiotis E. Theodorakis, A. Milchev, S.A. Egorov, A. Amirfazli, B. Hu, Z. Che Polish Academy of Sciences, Poland
17:00-17:20	220150	Tandem Droplet Breakup in Shear Flow under Low Weber Number Zhaoguang Wang*, Yijia Peng Shanghai Jiao Tong University, China
17:20-17:40	220158	Numerical Investigation of Gas-Liquid Flow Characteristics during Entrainment Qiuxiang Chen, Bo Xu, Mingyue Pei, Haijun Wang* Xi’an Jiaotong University, China
17:40-18:00	220163	Lubricant-induced tunability in self-driving nanodroplet on conical grooves Lin Guo, Yalong Kong, Zhigang Liu, Guihua Tang* Qilu University of Technology, China

Session 23
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Chao Tan

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No. : 993 8040 2026 (Password: 666888)

Koushare Meeting link: https://www.koushare.com/lives/room/155444

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220276	Synergistic erosion–corrosion behavior of X80 pipeline steel at various impingement angles in two-phase flow impingement Yanlin Zhao China University of Petroleum - Beijing, China
15:00-15:20	220226	CNN-based Liquid Hold-up Estimation in Counter-Current Flow using Electrical Capacitance Tomography Yuan Chen, Chang Liu, Yunjie Yang, Mathieu Lucquiaud and Jiabin Jia The University of Edinburgh, UK

15:20-15:40	220121	Coarse-grained CFD-DEM modeling of the fluidized bed coating process Hanqiao Che, Haigang Wang, Lijun Xu University of Birmingham, UK
15:40-16:00	220133	Correlation analysis of data-driven based measurement of gas-particle two-phase flow in CFB Xinyi Chen, Li Yi and Wang Haigang University of Chinese Academy of Sciences, China
16:00-16:20	220295	Zhijie Wang, Yanlin Zhao, Heng Shen, Jun Yao China University of Petroleum- Beijing, China
16:20-16:40	Coffee Break	
16:40-17:00	220296	Yuan Chen University of Edinburgh, UK
17:00-17:20	220297	Xiaoli Zhu, Raffaella Ocone China University of Petroleum- Beijing, China
17:20-17:40	220228	Experimental investigation of particle motion on electrostatics charge generation Ge Zhang, Yanlin Zhao, Jun Yao, Shuai Wang, Chi-Hwa Wang China University of Petroleum- Beijing, China
17:40-18:00	220212	Composition-Specific Centrifugal Granulation Characteristics of Molten Slag at Improved Throughput and at High Temperature of 1723 Kelvin Junjun Wu, Yu Tan, Yuxiang Fu, Hong Wang, Yudong Ding, Min Cheng, Xun Zhu, Qiang Liao* Ministry of Education, China

Session 24
Room Modeling and Numerical Methodologies（Topic 4）
Chairman: Yihang Li

Reporting time: July 29, 2022　14:30-18:00 pm (China Time)

Zoom Meeting No. : 922 2136 4884 (Password: 548192)

Koushare Meeting link: https://www.koushare.com/lives/room/086146

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220078	Fibre flow in 3D printing of discontinuous fibre reinforced thermoplastic composites Dongmin Yang The University of Edinburgh, UK
15:00-15:20	220081	Granular Flow in Hoppers: from Theory to Practice

		Qijun Zheng and Aibing Yu Monash University, Australia
15:20-15:40	220065	Study on temperature distribution of vertical liquid falling film with nanofluid Jian Zheng, Jesús Castro*, Asensio Oliva, Yue Liu Technical University of Catalonia, Spain
15:40-16:00	220072	Numerical investigation on the flow in a novel desulfurization reactor with structure optimization Pengyue Guo, Hao Zhang*, Gong Li, Xizhong An Northeastern University, China
16:00-16:20	220298	Haoqi Zhang The University of Edinburgh, UK
16:20-16:40	Coffee Break	
16:40-17:00	220130	A Continuum Model for the Segregation of Bidisperse Particles in a Blade Mixer Liuyimei Yang, Qijun Zheng and Aibing Yu Ganjiang Institute of Innovation, Chinese Academy of Sciences, China
17:00-17:20	220073	Rational design and exploit of catalysts for electrocatalytic reduction of CO2 based on density functional theory and machine learning Bo Xiong, Jing Liu*, Yingju Yang Huazhong University of Science and Technology, China
17:20-17:40	220241	Experimental and numerical simulation study on the fluidization behavior of Geldart-D particles in pressurized fluidized bed Hao Zhang, Siyi Shen, Weiyu Wang, Huibin Xu* Jiangsu University, China
17:40-18:00	220082	Numerical Study of Sludge Drying Process using Computational Fluid Dynamics-Discrete Element Method Gong Li, Hao Zhang*, Yinbiao Su, Xinglian Y, Aibing Yu, Ruiping Zou Monash University, Australia

July 30, 2022　08:00-11:50 am

Reporting time: July 30, 2022　8:00-8:40 am (China Time)

Zoom Meeting No. : 865 8269 4501 (Password: 186948)

Koushare Meeting link: https://www.koushare.com/lives/room/833966

Plenary lecture Chair: Jinliang Xu	
08:00-08:40	MPFL Introduction Bofeng Bai Xi'an Jiaotong University, China

Session 25
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Guangtao Duan

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 926 7419 9671 (Password: 538676)

Koushare Meeting link: https://www.koushare.com/lives/room/136297

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220277	Influence of magnetic field on the dynamics of liquid metal droplets impacting on solid or liquid surface Juancheng Yang Xi'an Jiaotong University, China
09:10-09:30	220115	Experimental study on liquid film inversion mechanism of annular flow in a helically coiled tube Shuai Liu, Li Liu*, Hanyang Gu Shanghai Jiao Tong University, China
09:30-09:50	220116	Experimental Study on Capillary Evaporation Based on PIV System Yi Li, Jian Chang*, Hanjin Wu Naval Armament department, Chnia
09:50-10:10	220124	Simulation of the hydraulic transport of non-spherical particles in a pipeline based on the CFD-DEM Wei Chen, Zheng Quan Li Jiangxi University of Science and Technology, China
10:10-10:30	Coffee Break	

10:30-10:50	220127	Title Numerical Simulation and Experimental Research on the Power Loss Characteristics of Flow Field in Integrated Pump-Motor Casing Yuan Huaijie, Ji Hai, Wang Juan, Sun Decan, Zhao Liang Xi'an Jiaotong University, China
10:50-11:10	220131	Two-fluid modeling of cratering from gas jet in a particles bed Li Zhenguang, U. U. Marcellus, Jiang Xiaoxue, Lu Huilin Harbin Institute of Technology, China
11:10-11:30	220143	Experimental study on pressure drops of R245fa flow boiling under hypergravity Chong Li, Xiande Fang *, Zufen Luo Nanjing University of Aeronautics and Astronautics, China
11:30-11:50	220147	SCO2-based Brayton cycle for thermoelectric conversion in hypersonic vehicles Yi-fan Zhang, Yuan Wang National University of Defence Technology, China

Session 26
Room Modeling and numerical methodologies（Topic 4）
Chairman: Jianhang Hu

Reporting time: July 30, 2022 08:40-11:50 am (China Time)

Zoom Meeting No. : 920 8107 2063 (Password: 557195)

Koushare Meeting link: https://www.koushare.com/lives/room/570630

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220009	Manipulating the flow of light & heat at nanoscale Jia Zhu Nanjing University, China
09:10-09:30	220145	Charged Particle Distribution of Laminar and Turbulent Flames considering Temperature Effect Chao Wang, Zhizhuo Zhen, Xiaoning Cao, Shuo Jin, Jiamin Ye* Tianjin University, China
09:30-09:50	220161	Numerical and Experimental study on the particle erosion impact and gas-particle hydrodynamics in an integral multi-jet swirling spout-fluidized bed Wenbin Li, Feng Wu,* Jiayi Guo, Jieyao Zhang, Xiaoxun Ma Northwest University, China
09:50-10:10	220167	A clouded bubble-based mass transfer model for the simulation of bubbling fluidized beds Kai Zhang, Guohui Gao, Shuai Wang Harbin Institute of Technology, China

10:10-10:30	Coffee Break	
10:30-10:50	220170	Dynamic PNM-DEM Modelling of particle-fluid flow and heat transfer Yi Zou, Yongli Wu, Qinfu Hou, Aibing Yu Monash University, VIC 3800, Australia
10:50-11:10	220182	Study of Relative Endwall Motion Effects on the Tip Clearance Flow Using Direct Numerical Simulations Wenqiang Shang, Dong Li, Kun Luo, Jianren Fan* Beijing Institute of Technology, China
11:10-11:30	220208	Application and Optimization Design of Special-Shaped Tube in Primary Heat Exchanger of Lead-Cooled Fast Reactor Jiayuan Zhao, Liangxing Li*, Haoxiang Zhao Xi’ an Jiaotong University, China
11:30-11:50	220162	Numerical simulation of gas-solid two-phase flow and desulfurization process in multi-nozzle fluidized bed Shuai Wang, Feng Wu,* Jiayi Guo, Ping Xiao, Xiaoxun Ma Northwest University, China

Session 27
Room Measurement and instrumentation Low carbon technology and new energy （Topic 5&10）
Chairman: Shibo Kuang

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 955 8998 5562 (Password: 805170)

Koushare Meeting link: https://www.koushare.com/lives/room/107854

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220012	Electrochemical CO2-to-CO conversion in solid oxide electrolysis cells Yihang Li Xidian University, China
09:10-09:30	220185	Investigation on Electrical Impedance Characteristics of Slug Flow in Small Channels Junchao Huang, Yandan Jiang, Haifeng Ji, Baoliang Wang, Zhiyao Huang Zhejiang University, China
09:30-09:50	220181	Effects of H2 addition on the OH chemiluminescence of NH3/air swirl flame Danan Chen, Jun Li*, Xing Li, Yijun Guo, Hongyu Huang, Noriyuki Kobayashi Chinese Academy of Sciences, China

09:50-10:10	220190	Cascade photothermal conversion of CO2 to ethylene by ZnO/Cu2O@Cu foam Shengjie Bai, Ya Liu, Liejin Guo Xi'an Jiaotong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220198	Macroencapsulated carbonate eutectic salt (Na2CO3-Li2CO3) phase change material for high temperature heat storage Lingxiao Zeng, Chunyu Zhu*, Nan Sheng, Yunqi Guo China University of Mining and Technology, China
10:50-11:10	220203	Study on Premixed Swirl Flame Structure of Organic Solid Waste Pyrolysis Gas Mixed with Ammonia Yijun Guo, Danan Chen, Xing Li, Jun Li*, Hongyu Huang, Noriyuki Kobayashi Chinese Academy of Sciences, China
11:10-11:30	220209	A flow-induced energy harvesting structure with multi-cylinder configuration Mengsi Li, Dunant Halim*, Yong Ren* University of Nottingham Ningbo China, China
11:30-11:50	220223	Simulation of the perovskite hollow fiber membrane module for O2 separation in oxy-fuel combustion system Lize Wang, Wenqi Zhong*, Aibing Yu Southeast University, China

Session 28
Room Modeling and numerical methodologies
Multiphase flow and heat transfer
（Topic 1&2）
Chairman: Dianyu E

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 941 2567 2969 (Password: 348535)

Koushare Meeting link: https://www.koushare.com/lives/room/706514

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220278	Evolution and quantification of distribution uniformity of bubbles using computational geometry Jianxin Xu Kunming University of Science and Technology, China
09:10-09:30	220299	Fully Coupled Molecular Dynamics – Fluctuating Hydrodynamics Model of Nanofluids Xinjian Liu, Ivan Korotkin, Sergey Karabasov and Zhonghao RAO*

		1 Hebei University of Technology, China 2 Queen Mary, University of London, the UK
09:30-09:50	220196	Study on desorption performances of ordered mesoporous SBA-15 with short channel Zhaohong He, Lisheng Deng, Qiwei Li, Jun Li, Lin Liu, Hongyu Huang*, Noriyuki Kobayashi Chinese Academy of Sciences, China
09:50-10:10	220152	Numerical simulation of flow and heat transfer of supercooled water injected into liquid lead-bismuth under LFR SGTR accident JunjieYuan, LiLiu*, HanyangGu Shanghai Jiao Tong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220154	Numerical investigation of shock driven gas infiltration in granular medium Jiarui Li, Kun Xue* Beijing Institute of Technology, China
10:50-11:10	220155	Numerical study of subcooled boiling heat transfer performance in topologically optimized microchannel heat sinks Jianhong Zhou, Xuemei Chen Nanjing University of Science and Technology, China
11:10-11:30	220166	A dynamic Lee model for two-phase closed thermosyphons (TPCPs) simulation by considering transient mass transfer time relaxation parameters Liang Ding, Wei Wang*, Bingrui Li, Bingxi Li Harbin Institute of Technology, China
11:30-11:50	220168	Effect of temperature on nanoparticle size and structure during simultaneous agglomeration and sintering Bingqi Chen, Daoyin Liu Southeast University, China

Session 29
Room Multiphase flow and heat transfer Measurement and instrumentation （Topic 2&5）
Chairman: Ben Xu

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 973 3903 9847 (Password: 729844)

Koushare Meeting link: https://www.koushare.com/lives/room/347928

Time	Article No.	Title Authors The first unit of the authors

08:40-09:10	Keynote 220279	Multiphase Heat Transfer and Additive Manufacturing in High Temperature Concentrated Solar Power (CSP) Systems Ben Xu Mississippi State University, USA
09:10-09:30	220188	A new method for online monitoring of flow boiling in microchannel Yuchen He, Qiang Huang, Junchao Huang, Yandan Jiang, Haifeng Ji*, Zhiyao Huang Zhejiang University, China
09:30-09:50	220172	Heat and Mass Transfer during Subcooled Film Boiling in Microgravity Environment Peng Liu, Jianfu Zhao, Wangfang Du, Huixiong Li, Lie Wei Chinese Academy of Sciences. Beijing 100190, China
09:50-10:10	220178	Capture the effect of heterogeneity on interphase heat transfer for gas-solid flow using DNS simulations Jianhong Fu, Sheng Chen*, Xiaochen Zhou Huazhong University of Science and Technology, China
10:10-10:30	Coffee Break	
10:30-10:50	220210	A novel bionic packed bed latent heat storage system filled with encapsulated PCM for thermal energy collection Xiangzhi Zhang, Yuying Yan, Yong Ren* University of Nottingham Ningbo, China
10:50-11:10	220175	A Numerical Study on the Mixed Convective heat transfer Characteristic in Structured Packed Beds Yuelong Qu, Liang Wang, Xipeng Lin, Zhiwei Ge, Haoshu Ling, Shuang Zhang, Haisheng Chen * Chinese Academy of Sciences, China
11:10-11:30	220216	Self-propellant force on Janus particles in the free molecular regime Kexue Zhang, Jun Wang1*, Guodong Xia Beijing University of Technology, China
11:30-11:50	220312	Precise characterization of three-dimensional structure and permeability of coal-based porous media Jiarui Sun, Jiannan Gong, Qili Wang China University of Mining &Technology (CUMT), Xuzhou 221116, P.R. China

Session 30
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Lin Chen

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 998 7357 5422 (Password:831477)

Koushare Meeting link: https://www.koushare.com/lives/room/078242

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220280	Edge formation of small droplet on a substrate – Nano-scale visualization of precursor film dynamics Atsuki Komiya Tohoku University, Japan
09:10-09:30	220014	Experimental Study on Two-phase Flow Characteristics in A Long Pipeline-riser System Ye-qi Cao, Qiang Xu, Bo Huang, Hai-yang Yu, Lie-jin Guo* Xi’ an Jiaotong University, China
09:30-09:50	220018	Numerical investigation of the gravity effect on Neon condensation heat transfer and fluid flow characteristics inside horizontal tubes Falong He, Wangfang Du, Jianfu Zhao *, Jianyin Miao, Hongxing Zhang, Jiang He, Sixue Liu, Chang Liu Chinese Academy of Sciences, China
09:50-10:10	220035	Droplet Formation and Impingement Dynamics of Low-boiling Refrigerant under Atmospheric Pressure Shuyan Chen, Zhifu Zhou*, Bin Chen Xi’ an Jiaotong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220041	Flow and heat transfer characteristics of S-CO2 in a vertically rising Y-tube Xiaohong Hao, Su Du, Sen Zhang, Qi Zhang, Qiguo Yang University of Shanghai for Science and Technology, China
10:50-11:10	220015	Study of the Boiling Characteristic of Electronic Cigarette Oil on a Porous Ceramic Surface Dongqing Zhu, Ran Yang, Shuyan Chen, Zhifu Zhou*, Bin Chen Xi'an Jiaotong University, China
11:10-11:30	220017	Technical exploration on preparation of hydrogen, metal elements and metallic oxides simultaneously by supercritical water gasification Haopeng Kang, Qiang Xu, Zeshui Cao, Xuyang Lu, Liejin Guo* Xi'an Jiaotong University, China
11:30-11:50		

Session 31
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Hisashi Nakamura

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 962 9633 7861 (Password: 002551)

Koushare Meeting link: https://www.koushare.com/lives/room/062436

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220281	Reaction zone separation by a micro flow reactor with a controlled temperature profile for validation of chemical reaction models of hydrocarbons, ammonia, refrigerants, and battery electrolytes Hisashi Nakamura Tohoku University, Japan
09:10-09:30	220264	A modified model of drag for single particle of the multi-particle system in supercritical water Xiaoyu Li, Huibo Wang, Yi Li, Hui Jin Xi'an Jiaotong University, China
09:30-09:50	220021	Temperature field prediction of aero-engine bearing chamber based on machine learning method Jiang Wang, Ye-Chun Wang, Lie-Jin Guo* Xi'an Jiaotong University, China
09:50-10:10	220252	Simulation and Experimental Study on Gas-Liquid Two Phase Flow in Long Pipeline-S-Riser System Bo Huang, Qiang Xu, Yeqi Cao, Haiyang Yu, Liejin Guo* Xi'an Jiaotong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220020	A Novel Mathematical Modeling and Optimization Approach for Supercritical Water Gasification Reactor Design Jialing Xu, Zhiyong Peng, Siqi Rong, Hui Jin, Liejin Guo* Xi'an Jiaotong University, China
10:50-11:10	220243	A New Calculation Method and Model of Hydrate Slurry Flow of The Multiphase Pipeline in Deep Water Gas Field Yan Gao, Yue Xu , Kunming Song, Xin Geng, Wuchang Wang*, Yuxing Li*. China University of Petroleum (East China), China
11:10-11:30	220025	The state-of-the-art of CO2 flow assurance Zhilin Yang Equinor ASA, Trondheim, Norway
11:30-11:50		

Session 32
Room Reactive multiphase flow（Topic 3）
Chairman: Hao Zhang

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 996 9971 0923 (Password: 996572)

Koushare Meeting link: https://www.koushare.com/lives/room/924886

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220282	Modelling subcooled boiling flows at low pressure: a complex multi-scale phenomenon Sherman Cheung RMIT University, Australia
09:10-09:30	220022	A directional ghost-cell immersed boundary method for reactive gas-solid flow with interphase heat and mass transfer Zhisong Ou, Liejin Guo* Xi'an Jiaotong University, China
09:30-09:50	220032	Multi-level vortex generator tube for enhanced flotation in wide range of fine particle diameters Xiaokang Yan*, Zixu Su , Zhixin Sun, Lijun Wang, Haijun Zhang, Yijun Cao China University of Mining and Technology, China
09:50-10:10	220034	Experimental Investigation on the Microscopic Characteristics of the Aerosol Produced by Porous Ceramic Atomizer of E-cigarettes Ran Yang, Dongqing Zhu, Shuyan Chen, Zhifu Zhou*, Bin Chen Xi'an Jiaotong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220033	Study on the Mechanism of Taylor vortex flow and mass transfer in a kettle reactor Li Ye, Tengfei Wan, Xiaohui Xie, Lin Hu University of Shanghai for Science and Technology, China
10:50-11:10	220043	The Effect of Absorption/Scattering on the Measurement of Blood Flow Velocity by Laser Speckle Imaging Method Ruixi Cao, Xu Sang, Dong Li, Bin Chen* Xi'an Jiaotong University, China
11:10-11:30	220037	The propagation of gas-liquid interface wave in the tank upon step reduction in gravity Lie Wei, Wangfang Du, Falong He, Jianfu Zhao*, Kai Li CAS Key Laboratory of Microgravity (National Microgravity Laboratory), Institute of Mechanics, Chinese Academy of Sciences, China
11:30-11:50	220062	Prediction of the pressure drop and film distribution in separated flow in horizontal pipe Yubo Wang*, Zhaodi Wu, Yingjie Chang, Zhigang Liu, Xiangyuan Zhao Shandong Jianzhu University, China

Session 33
Room Modeling and numerical methodologies（Topic 4）
Chairman: Gherhardt Ribatski

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 923 8670 3053 (Password: 920280)

Koushare Meeting link: https://www.koushare.com/lives/room/896856

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 220283	Liquid Film Characteristics during Horizontal Annular Flows for In-Tube Evaporation and Condensation Gherhardt Ribatski University of São Paulo (USP), Brazil
09:10-09:30	220039	Numerical Simulation of H2 Production in a Bubbling Fluidized Bed Tianyu Wang, Bin Wu, Peng Wang, Runzhe Gao, Yurong He* Harbin Institute of Technology, China
09:30-09:50	220051	Pore-scale modeling of heat-moisture and stress-strain distribution for insight in mechanism of drying shrinkage on high-moisture porous media” Yuejin Yuan, Libin Tan, Yingying Xu, Yueding Yuan* Shaanxi University of Science and Technology, China
09:50-10:10	220044	Study on steam jet condensation of subcooled water flow in a vertical pipe Chenying Liu, Yongshuai Zhu, Haozu Zhou, Shuaizhi Jiang, Qiang Xu** Xi'an Jiaotong University, China
10:10-10:30	Coffee Break	
10:30-10:50	220040	Boiling heat transfer performance on changeable wettability surfaces Yanwei Hu, Yaohui Yang, Xiaohang Zhu, Xiaoyi Liu, Yurong He* Harbin Institute of Technology, China
10:50-11:10	220092	Investigation of condensate droplet movement in Marangoni Condensation of ethanol-water mixtures by infrared thermography Ziqiang Ma, Guilong Zhang, Mengyu Sun, Jinshi Wang*, Junjie Yan Xi'an Jiaotong University, China
11:10-11:30	220052	Interaction mechanism between a ventilated supercavity with exhausted hot gas Min. Xiang†, Xiaoyu Zhao,Weihua Zhang, Shangzhong Li National University of Defense Technology, China

11:30-11:50		

Session 34
Room Measurement and instrumentation（Topic 5）
Chairman: Haigang Wang
Wuliang Yin

Reporting time: July 30, 2022　08:40-11:50 am (China Time)

Zoom Meeting No. : 926 6359 0630 (Password: 223911)

Koushare Meeting link: https://www.koushare.com/lives/room/889423

Time	Article No.	Title Authors The first unit of the authors
08:40-09:10	Keynote 216255	Yi Li Tsinghua University, China
09:10-09:30	220053	Thermal Capillary Convection Determined Bubble Evolution During Photoelectrochemical Water Splitting Xiaowei Hu, Jugan Zheng, Yechun Wang, Shaohua Shen* Shaanxi University of Science & Technology, China
09:30-09:50	220055	Conductivity evaluation of cross propped fractures in shale reservoirs Li Ma Southwest Petroleum University, China
09:50-10:10	220191	Theoretical model of liquid film variation and heat transfer during flow boiling in rectangular microchannels Peng Zhang, Tao Wang, Yuyan Jiang*, Chaohong Guo Chinese Academy of Sciences, China
10:10-10:30	Coffee Break	
10:30-10:50	220137	Numerical study on the gas-solid flow characteristics in a fluidized bed dryer Zhiyang Ma, Qiuya Tu, Haigang Wang Chinese Academy of Sciences, China
10:50-11:10	220109	Efficient super-resolution image reconstruction of electrical capacitance tomography for gas-solid fluidized bed measurement Jian Li, Zheng Tang, Biao Zhang, Chuanlong Xu Southeast University, China
11:10-11:30	220110	Cohesive particle fluidization in bubbling fluidized bed with a computationally generated two-fluid model Guodong Liu†, Zhonghua Li, Junnan Zhao, Sankaran Sandaresan† Harbin Institute of Technology, China
11:30-11:50		

July 30, 2022　14:30-18:30 pm

Session 35
Room Multiphase flow in industrial process（Topic 6）
Chairman: Günter Brenn

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 985 1447 2385 (Password: 666888)

Koushare Meeting link: https://www.koushare.com/lives/room/043587

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220254	Self-similar pressure-atomized sprays with heat and mass transfer Günter Brenn, Hannes Hinterbichler, Helfried Steiner Graz University of Technology,　Austria
15:00-15:20	220118	Steady-state thermal-hydraulic response of supercritical natural circulation loop under different loop orientations Tanuj Srivastava, Dipankar N Basu Department of Mechanical Engineering, IIT Guwahati, Assam-781039, India
15:20-15:40	220056	Investigation of the charge transport kinetics and photoelectrochemical properties of CuInS2/R-TiO2 NTs heterostructures photoanode Ruo-Chen Lu, Qing-Yun Chen* Xi'an Jiaotong University, China
15:40-16:00	220140	Numerical Investigation of the Dynamic Measurement for Gas-Oil Two-Phase Pipeline Flow Based on the Virtual ECT Sensor Yi Xu, Hao Pu, Haigang Wang Chinese Academy of Sciences, China
16:00-16:10	Coffee Break	

Session 36
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Yannis Hardalupas

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 926 1370 8760 (Password: 612157)

Koushare Meeting link: https://www.koushare.com/lives/room/687413

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220284	Atomisation of liquid fuels for low carbon power generation Yannis Hardalupas UK
15:00-15:20	220245	Internal reaction behavior and kinetics of iron ore reduction by biomass Zeshui Cao, Qiang Xu, Haopeng Kang, Liejin Guo* Xi'an Jiaotong University, China
15:20-15:40	220201	CFD-DEM investigation on solid-gas reaction for adsorption carbon capture in circulating fluidized bed Y. Zhuang, L. Jiang*, D.M. Sun Zhejiang University, China
15:40-16:00	220247	Single bubble dynamics on a TiO2 photoelectrode surface during photoelectrochemical water splitting Teng-fei Nie, Qiang Xu, Zhi-qing Li, Xin-yi Luo,Yong-lu She, Lie-jin Guo* Xi'an Jiaotong University, China
16:00-16:10	Coffee Break	

Session 37
Room Organic waste conversion and utilization（Topic 8）
Chairman: Lingxi Li

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 913 2628 4160 (Password: 438230)

Koushare Meeting link: https://www.koushare.com/lives/room/550036

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220239	Simulation of light scattering from a colloidal droplet using a polarized Monte Carlo method: application to the time-shift technique Lingxi Li University College London, UK
15:00-15:20	220244	Experimental Study on Hydrogen Reduction of Iron Oxide at Low Temperature

		Xu-yang Lu, Qiang Xu, Lie-jin Guo* Xi'an Jiaotong University, China
15:20-15:40	220221	A review of study and application of thermal bubble driving process in two-phase flow Dongqing Wang, Pingjian Ming* Sun Yat-sen University, China
15:40-16:00	220084	Modeling and analysis of low-carbon blast furnace ironmaking technologies Shibo Kuang, Aibing Yu Monash University, Australia
16:00-16:10	Coffee Break	

Session 38
Room Multiphase flow and heat transfer（Topic 2）
Chairman: Tianyu Wang

Reporting time: July 30, 2022 14:30-18:30 pm (China Time)

Zoom Meeting No. : 934 9305 2227 (Password: 605373)

Koushare Meeting link: https://www.koushare.com/lives/room/097298

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220059	Energy-saving Opportunities through Advanced Control of Continuous Frying Systems Hongwei Wu University of Hertfordshire, UK
15:00-15:20	220177	Insight into transport performance at the interface of porous catalytic particle by means of numerical simulation Xuesong Yang, Guohui Gao, Shuai Wang* Harbin Institute of Technology, China
15:20-15:40	220300	MUHAMMAD MUBASHAR OMAR University of Agriculture, Pakistan
15:40-16:00	220186	Research on flow boiling in plate-fin heat exchanger based on optical fibers Xiao Yang, Huajun Li, Haifeng Ji, Baoliang Wang, Zhiyao Huang Zhejiang university, China
16:00-16:10	Coffee Break	

Session 39
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Jianxin Xu
Yi Li

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 937 5735 3181 (Password: 947238)

Koushare Meeting link: https://www.koushare.com/lives/room/509052

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220285	Applications of Magnetic Induction Tomography (MIT): imaging molten steel flow and copper slag solidification processes Wuliang Yin The University of Manchester, UK
15:00-15:20	220301	Jiangtao Sun Beihang University, China
15:20-15:40	220302	Study on Oil-Water Separation Based on a New Stirred Reactor Qiuyue Zhao Northeastern University, China
15:40-16:00	220227	Numerical simulation of secondary breakup of shear-thinning droplets Yang Li, Zhikun Xu, Xiaoyun Peng, Tianyou Wang, Zhizhao Che* Tianjin University, China
16:00-16:10	Coffee Break	

Session 40
Room Interfacial phenomena & mechanisms（Topic 1）
Chairman: Zhizhao Che

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 980 9901 1255 (Password: 399301)

Koushare Meeting link: https://www.koushare.com/lives/room/120745

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220286	Multiphase Flows Speak the Language of Instabilities Prashant Valluri

		The University of Edinburgh, UK
15:00-15:20	220303	Panagiotis Theodorakis Polish Academy of Sciences, Poland
15:20-15:40	220304	Hongying Li Institute of High Performance Computing, Singapore
15:40-16:00	220305	Emilia Nowak Massey University, New Zealand
	Keynote 220306	Flow Dynamics and Heat Transfer of Droplets in Spray Combustion Zhizhao Che Tianjin University, China
16:00-16:10	Coffee Break	

Session 41
Room Modeling and numerical methodologies（Topic 4）
Chairman: Dong Li

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 941 7620 6349 (Password: 419711)

Koushare Meeting link: https://www.koushare.com/lives/room/687274

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220275	Fluidization performances of particles in a microwave reactor Yaning Zhang Harbin Institute of Technology, China
15:00-15:20	220251	Microscopic mechanism for nanoparticle-laden droplet-droplet electrocoalescence: A molecular dynamics study Bin Li*, Mingdong Ju, Zhentao Wang, Huibin Xu Jiangsu University, China
15:20-15:40	220225	Numerical study on the acoustic measurement of concentration of dispersion in dilute gas-solid two phase flow Yanqin Li, Kailong Wang, Shipeng Ren Zhengzhou University, China
15:40-16:00	220261	Learning-based quantitative multiphase flow imaging with field coupling model and ECT Shengnan Wang, Jiawang Qiu Lin, Yunjie Yang The University of Edinburgh, UK; Yangzhou University, China

16:00-16:10	Coffee Break

Session 42
Room Multiphase flow in industrial process（Topic 6）
Chairman: Tianqi Tang

Reporting time: July 30, 2022　14:30-18:30 pm (China Time)

Zoom Meeting No. : 971 3803 9909 (Password: 374533)

Koushare Meeting link: https://www.koushare.com/lives/room/434237

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220217	Stability and accuracy enhancement of Lagrangian particle methods for droplet flows Guangtao Duan The University of Tokyo, Japan
15:00-15:20	220259	Reactor network model establishment and dynamic study of fluidized bed reactor Cui Wang, Hui Jin* Xi'an Jiaotong University, China
15:20-15:40	220233	Numerical Study on multi-size bubbly flow in single snorkel refining furnace Nan Ye, Fengsheng Qi, Zhongqiu Liu, Baokuan Li, Chipok Chueng Northeastern University, China
15:40-16:00	220236	Studies on spontaneous condensation of moist air in high-speed turbo-expander with varying droplet growth models Xiaoling Yang, Liang Chen, Yang Meng, Zhefeng Wang, Shuangtao Chen, Yu Hou Xi'an Jiaotong University, China
16:00-16:10	Coffee Break	

Session 43
Room Multiphase flow in industrial process（Topic 6）

Chairman: Dongmin Yang

Reporting time: July 30, 2022 14:30-18:30 pm (China Time)

Zoom Meeting No. : 932 1201 1262 (Password: 925846)

Koushare Meeting link: https://www.koushare.com/lives/room/442381

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote 220242	Particle-scale modelling of injected hydrogen and coke co-combustion in the raceway of an ironmaking blast furnace Dianyu E Jiangxi University of Science and Technology, China
15:00-15:20	220156	Hydroformylation of long-chain olefins multiphase flow and reaction enhanced by microbubbles Luhaibo zhao*, Chuanlong Xu, Zhiyong Tang Chinese Academy of Sciences (CAS), China
15:20-15:40	220219	Numerical Simulation of Shaft Gas Injection Operation in Oxygen Blast Furnace Haiqi Nie, Shibo Kuang, Lulu Jiao, Aibing Yu Southeast University, China
15:40-16:00	220253	Numerical investigation of tangential inlet area on separation performance in hydrocyclones Haihan Fan, Dianyu E, Zhongfang Su, Guangtai Xu, Jiaxin Cui, Shibo Kuang, Ruiping Zou, Aibing Yu Jiangxi University of Science and Technology, China
16:00-16:10	Coffee Break	

Session 44
Room Multiphase flow in industrial process（Topic 6）
Chairman: Jinwen Shi

Reporting time: July 30, 2022 14:30-18:30 pm (China Time)

Zoom Meeting No. : 997 3440 7990 (Password: 256005)

Koushare Meeting link: https://www.koushare.com/lives/room/015061

Time	Article No.	Title Authors The first unit of the authors
14:30-15:00	Keynote	Modelling and analysis of non-Newtonian suspension flows

	220220	Shibo Kuang, Aibing Yu and Murray Rudman Monash University, Australia
15:00-15:20	220174	Numerical investigation of the impact of tuyere injecting coke oven gas and reformed coke oven gas on the dynamic raceway in an ironmaking blast furnace Ehsan Farajzadehdevin, Yuting Zhuo, Yansong Shen* University of New South Wales, Australia
15:20-15:40	220218	Combined Particle Size and Density Segregation in a Horizontal Rotating Drum: A CFD Analysis Rezwana Rahman, Haiping Zhu and Aibing Yu Western Sydney University, Australia
15:40-16:00		
16:00-16:10	Coffee Break	

5.3 Closing ceremony

Reporting time: July 30, 2022　16:10-18:00 pm (China Time)

Zoom Meeting No. : 865 8269 4501 (Password: 186948)

Koushare Meeting link: https://www.koushare.com/lives/room/833966

Closing ceremony Chair：Bofeng Bai		
16:10-16:50	Plenary lecture	Enhancement of multiphase reacting flow: coal gasification in supercritical water as an example Hui Jin Xi'an Jiaotong University, China
16:50-17:30	Plenary lecture	Multifield coupled concentrated-solar-driven catalytic water splitting for hydrogen production Maochang Liu Xi'an Jiaotong University, China
17:30-18:00	Speech at the closing ceremony	

6. Award & Publication

Selected papers will be recommended to:

Science Bulletin（Invited Only, IF=11.78）

Applied Thermal Engineering（Special issue, IF=5.295）

Petroleum Science（Invited only， IF=4.090）

Physics of Fluids（Special Issue, IF=3.521）

Flow Measurement and Instrumentation（Special Issue, IF=2.037）

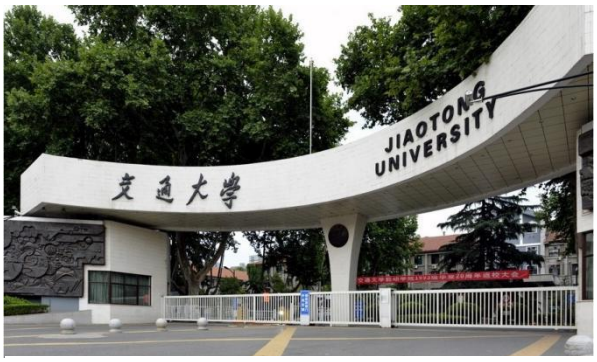
Energy Sources, Part A: Recovery, Utilization, and Environmental Effects（Invited Only, IF=3.447）

Conference main page:

https://www.koushare.com/topicIndex/i/MTCUE-2022

Introduction of the organizer

Xi'an Jiaotong University



Xi'an Jiaotong University (XJTU) is a comprehensive research-oriented national key university directly under the Ministry of Education of the People's Republic of China, jointly established by the Ministry of Education and the State Administration of Science and Technology for National Defence. It is one of the first batch of key universities under the "211 Project" and "985 Project", and was selected as one of the "Everest Plan" and "Strong Foundation Plan" of China. The university has been selected as one of the first batch of key universities under the national "Everest Plan", "Strong Foundation Plan", "2011 Plan", "111 Plan", "Excellent Engineer Education and Training Plan", "Excellent Doctor Education and Training Plan It is also a member of the Pacific Rim University Consortium, C9 Consortium, China Association of University Presidents, Global Energy Internet University Consortium, China-Russia Comprehensive University Consortium, China-Russia Transport University Consortium, CDIO Engineering Education Consortium, Silk Road University Consortium, the chairman of China Joint Association of Artificial Intelligence Education, and one of the three universities in China offering It is one of the three universities in China to offer junior classes.

In 1896, Nanyang Public School was founded in Shanghai; in 1921, it was named as Jiaotong University; in 1956, the main body of Jiaotong University moved to Xi'an; in 1957, it was divided into two parts, Xi'an and Shanghai, to implement unified leadership; in 1959, the Xi'an part of Jiaotong University was named as Xi'an Jiaotong University; in 2000, the State Council decided to In 2000, the State Council decided to merge the three universities to form the new Xi'an Jiaotong University.

As of May 2021, the four campuses of Xingqing, Yanta, Qujiang and West China Science and Technology Innovation Port cover an area of about 4,480 mu, with 27 faculties (departments and centres) and 9 undergraduate colleges, offering 90 undergraduate majors; 30 post-doctoral stations, 32 first-level disciplinary doctoral

sites, 5 professional degree doctoral sites, 41 first-level disciplinary master's sites and 27 professional degree master's sites. There are 6,538 teaching staff and 46,323 students, including 21,141 undergraduates and 25,182 postgraduates. As of January 2021, there are 6551 teaching staff, including 3717 full-time teachers. The faculty includes 45 academicians from the two academies, 6 national teaching masters, 42 recipients of the National Outstanding Youth Science Foundation, 25 national experts with outstanding contributions, 30 candidates from the National "Hundred Million Talents Project" and the "Hundred Million Talents Project for the New Century", and the leader of the Innovation Team of the Ministry of Education. There are 29 leaders of innovation teams of the Ministry of Education, 234 candidates selected by the Ministry of Education for the "New Century Excellent Talents Training Program", and 491 experts who have made outstanding contributions to the country and receive special government allowances.

As of September 12, 2019, Xi'an Jiaotong University has 32 first-level disciplines authorized for doctoral degrees, 43 first-level disciplines authorized for master's degrees, 5 professional degree authorization points for doctoral degrees, 27 professional degree authorization points for master's degrees, and 30 postdoctoral research stations (as of October 2019). The university has 8 "double first-class" construction disciplines, 8 first-class national key disciplines, 8 national second-class key disciplines, 3 national second-class key disciplines, 27 first-class key disciplines at provincial (ministerial) level, and 155 second-class key disciplines at provincial (ministerial) level. Since 2006, Xi'an Jiaotong University has been the first university in China to implement the "College System", in which all undergraduates are enrolled in the College, and in 2007, the university established the "Qian Xuesen Experimental Class". In 2007, the university established the "Qian Xuesen Experimental Class" to cultivate top talents and the "Zonglian Experimental Class" in medicine to explore the mode of cultivating talents in accordance with the laws of medical education. In 2010, the first "Experimental Class for Top Talents in Basic Sciences" was launched. "By

2013, the school had achieved 60 national teaching achievement awards, built 34 national quality courses and had 8 national teaching bases.

Since 2000, Xi'an Jiaotong University (XJTU) has been awarded 21 projects under the "973 Program" and 4,323 projects under the National Natural Science Foundation of China (NSFC) as the chief scientist. 506 NSFC projects were awarded to XJTU in 2017. During the period from 2012 to 2016, the University ranked fifth in the country in terms of the number of three national science and technology awards it received as the first completing unit. In 2017, the university was awarded seven national science and technology awards as the first-completed unit, ranking second in China's universities. As of 2013, Xi'an Jiaotong University has been awarded 26 of the "National Award for 100 Outstanding Doctoral Dissertations", and 40 of them have been nominated for the award. 397 highly cited papers were listed in the ESI database in January 2018, with a total of 35,216 papers and 299,401 citations.

As of 20 May 2019, since 2000, Xi'an Jiaotong University has invited 25 Nobel Prize and Fields Prize winners and more than 2,000 foreign professors to visit and lecture, and more than 20,000 scholars, corporate executives and government dignitaries from all over the world have collaborated in research and academic exchanges; teachers and students have been sent to visit, further study, research and study for degrees abroad The University has established inter-university cooperation with more than 300 universities and research institutes in 44 countries and regions, including the United States, Japan, Britain, France, Germany, Italy, New Zealand and Korea; the "Silk Road University Consortium" has been established with 154 universities from 38 countries and regions. The Silk Road University Alliance has attracted 154 universities from 38 countries and regions.The "Spirit of Westward Migration" is a valuable spiritual treasure that emerged during the relocation of Jiao Tong University from Shanghai to Xi'an in 1956. The relocation of the University was a major move by the state to adjust the layout of higher education and industrial construction, and a group of intellectuals with the overall situation in mind responded to the call of the state by giving up their superior and comfortable working and living conditions and running from the banks of the Huangpu River to the difficult conditions of the ancient city of Xi'an. Since its relocation, Xi'an Jiaotong University has trained a total of 250,000 university students, more than one-third of whom work in the west; nearly half of the 33 academicians it has trained work in the west. All this has laid the foundation of higher education for the industrial development of the west. During the

process of moving the university and the 60 years of running the university in the west, Jiao Tong University has inherited the excellent teaching style, carried forward the character of hard work and forged the "Westward Migration Spirit", which is unique to Jiao Tong University and Shaanxi's higher education sector, with the core connotation of "having the overall situation in mind, selfless dedication, carrying forward the tradition and hard work. "The Library is a unique institution of higher education in Jiaotong University and Shaanxi Province.

As of July 2018, the library has a cumulative collection of 5.44 million volumes (pieces), more than 10,000 printed newspapers and journals, and more than 2,000 current journals; 111 domestic and international electronic platform resources, with a total of 312 sub-libraries, 95,000 Chinese and foreign language electronic journals, and more than 1.6 million Chinese and foreign language electronic books. The library has formed a multidisciplinary collection system combining science, engineering, management and literature, with emphasis on machinery, energy, power, electricity, electronics, information, materials, control, and medicine and finance. The library also has a collection of 15 world-renowned journals with a history of over 100 years, which have been continuously collected from their founding issues to date. It also has a large collection of scientific and technical reports, dissertations, conference documents, technical standards, patent documents and audio-visual and microfilm materials.

Looking to the future, the university will carry forward the spirit of the westward migration of Jiaotong University, with the goal of building a distinctive world-class university, with the overall situation in mind, selfless dedication, carry forward the tradition, hard work and entrepreneurship, and strive to promote the development of the university to achieve new historical leaps.

State Key Laboratory of Multiphase Flow in Power Engineering

The State Key Laboratory of Multiphase Flow in Power Engineering was approved for construction by the State Planning Commission in 1990, completed in 1992 through the national acceptance, and officially opened to the public in 1993. The directors of the laboratory were Prof. Chen Xuejun, academician of the Chinese Academy of Sciences and founder of the discipline of multiphase flow thermal physics in China, Prof. Chen Xinkuan, national expert with outstanding contribution, and Prof. Guo Liejin, academician of the Chinese Academy of Sciences and expert in the field of engineering thermal physics and energy utilization. Prof. Yue Guangxi, an academician of the Chinese Academy of Engineering. The current director of the laboratory is Professor Guo Liejin, an academician of the Chinese Academy of Sciences, and the academic committee is headed by Professor Jin Hongguang, an academician of the Chinese Academy of Sciences.

The laboratory is the only State Key Laboratory in the field of multiphase flow in China. Since its establishment, the laboratory has been ranked the first in its discipline in all national assessments, and in March 1997, the laboratory received the first national assessment in the field of materials and engineering science organized by the Ministry of Science and Technology and the National Natural Science Foundation of China, and was ranked the first in the field of engineering thermophysics and energy utilization. In 2004, it was awarded the "Advanced Group of State Key Laboratory Program" by the Ministry of Science and Technology and received the Golden Bull Award.

The laboratory is based on the first batch of national key disciplines of "Power Engineering and Engineering Thermophysics" of Xi'an Jiaotong University, and supported by national key disciplines of thermal engineering, power machinery and engineering, nuclear energy science and engineering, etc. The research fields cover power engineering and engineering thermophysics, nuclear science and technology,

chemical engineering and technology, mathematics The research areas involve power engineering and engineering thermophysics, nuclear science and technology, chemical engineering and technology, mathematics, chemistry, physics and other primary disciplines, including 10 traditional secondary disciplines and one new secondary discipline of new energy science and engineering led by the laboratory. The laboratory focuses on the core theme of "multiphase flow science and technology" and organically integrates theoretical modelling and numerical methods of multiphase flow, thermophysics and thermochemistry, photophysics and photochemistry, biophysics and chemistry in the fields of refrigeration and low temperature engineering, chemical and process machinery, computational mathematics, applied physics, applied The laboratory has gradually built up a research base with strong crossover, wide coverage and outstanding innovation, and carries out research on processes and systems, their basic phenomena, basic laws, system theories and key technologies for the purpose of efficient development, transformation and utilization of energy and energy conservation and emission reduction. The laboratory provides good support conditions for domestic research in power engineering and engineering thermophysics and related disciplines, has become an important part of the national science and technology innovation system, and is an important base for conducting basic and applied fundamental research in the field of multiphase flow, gathering and training outstanding scientists and conducting high-level academic exchanges in China.

The overall orientation of the laboratory is to carry out innovative research on the basic and applied fundamental theories and key technologies in the efficient and clean development, transformation and utilisation of fossil and renewable energy sources and in the design and safe and economic operation of high performance energy materials, equipment and systems. Special emphasis will be placed on the research of fundamental theories and laws in energy and power engineering, petroleum engineering, chemical engineering, multiphase flow thermal physics and thermochemistry in aerospace, photovoltaic/electrophysics and chemistry, and biophysics and chemistry, and extended to highly integrated and innovative research of processes and systems. Through sustained efforts, we aim to build a top international, multi-functional, integrated and open base for innovative research on basic theories in energy science and core and key technologies and high technologies in the energy industry, and for the gathering of first-class talents.

The overall objectives of the laboratory are to integrate effective resources, build a unique research platform, attract top international scholars to carry out research on the frontiers of energy science and the major needs of the national economy, and build a high quality research team with a reasonable age structure. The research team will explore the major basic theoretical problems of energy development, transformation and utilization, and pay attention to the comprehensive cross-innovation and integrated innovation of energy transformation and utilization with other disciplines; focus on solving the major scientific problems and key technical problems in this field The Institute will be a major base for basic and high technology research, a highland for training and gathering high-level first-class talents, and a centre for high-level international cooperation and exchange, and will provide source support for the innovation-driven development of China's energy science and technology industry.

Focusing on the above objectives and positioning, the laboratory has carried out systematic basic theoretical innovation and key technology research in four research directions, including high-pressure steam (gas) and liquid two-phase flow and heat transfer and its safety, multiphase flow thermochemistry and efficient clean low-carbon renewable energy conversion, multiphase flow photoelectric thermochemistry principles and technology for renewable energy conversion and utilization, and basic theory of multiphase flow thermophysics in special environment and its measurement and control technology and application. The research covers seven major strategic directions in the energy field, including clean and efficient conversion and utilization of coal, oil and gas development, storage and utilization, efficient utilization of renewable energy, hydrogen energy and fuel cells, energy storage and distributed energy, nuclear energy and nuclear technology, and frontier common fundamentals of new energy power technology. It has played an important supporting and irreplaceable role in the national science and technology development, social and economic development and national security in the field of energy and power in China.

Academician Liejin Guo

The 1st World Conference on Multiphase Transportation, Conversion & Utilization of Energy (MTCUE) initiated by Academician Guo Liejin, Director of the State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University.

Prof. Liejin Guo received his bachelor and doctor's degree from Xi'an Jiaotong University (China) in 1983 and 1989, respectively. He held faculty positions as Assistant Professor, Lecturer and Full Professor of Xi'an Jiaotong University in 1989, 1990 and 1992, respectively. He was a Senior Research Fellow/Visiting Professor of the University of Birmingham (1995-1996), United Kingdom. He was a Distinguished Professor under "Cheung Kong Scholar Program" of the Ministry of Education of China" (1999), and the Director of State Key Laboratory of Multiphase Flow in Power Engineering (2002-present), Dean in School of Energy and Power Engineering (2003-2009). He was an honorary professor of the University of Queensland (2009-2016) and Monash University (2016-present), Australia. He was elected an Academician of Chinese Academy of Science (2017), and fellow of The World Academy of Science (2021). He serves as the Associate Editor-in-Chief of Journal of Photonics for Energy, Advisory Editorial of Board Member of eScience, and a member of the Editorial Board of International Journal of Multiphase Flow, International Journal of Heat Mass Transfer, and International Journal of Hydrogen Energy.

Thank you for your participation!