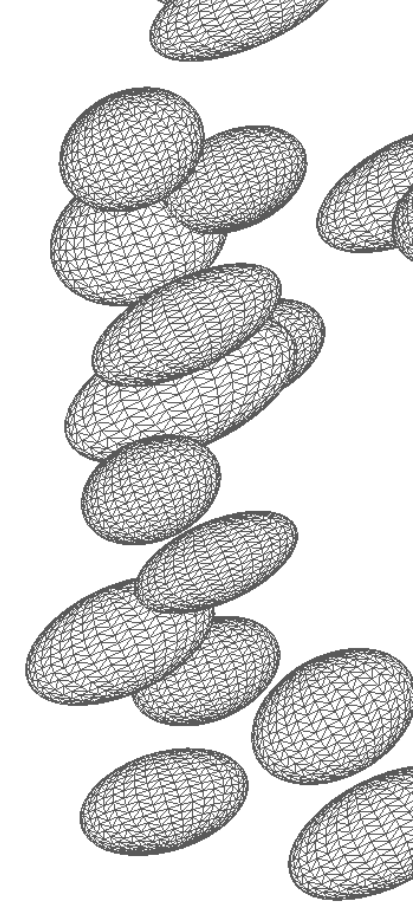
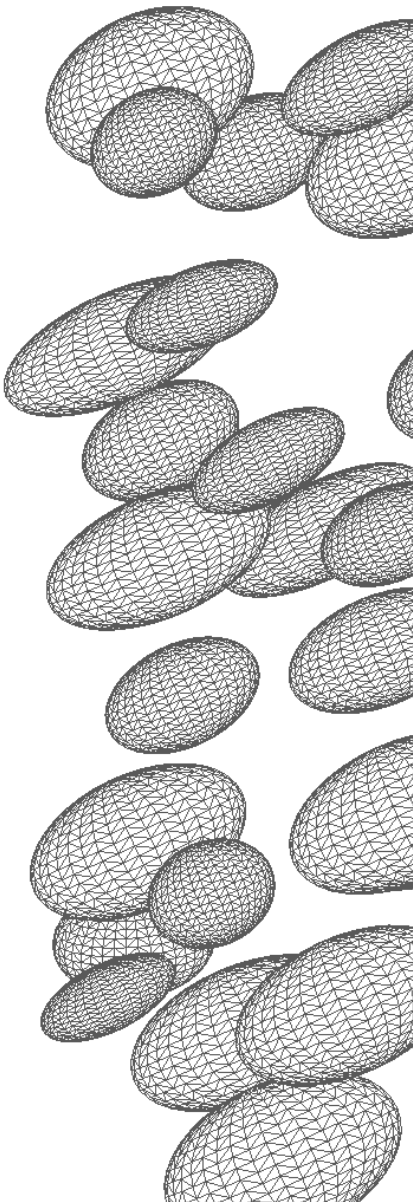
ICMF 2023

The 11th International Conference on Multiphase Flow

April 2-7, 2023, Kobe International Conference Center, Kobe, Japan

Program Booklet





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Welcome to ICMF-2023

It is our great pleasure to welcome you to the 11th International Conference on Multiphase Flow, which is to be held in Kobe, Japan from April 2-7, 2023 at Kobe International Conference Center.

The 1st ICMF was held in Tsukuba, Japan in 1991 and then the 2nd was again in Japan, Kyoto in 1995. Since then, ICMF has been governed by the ICMF Governing Board, and has been held every three years in the three geographical regions in the order of Europe, America and Asia-Oceania. ICMF has been playing a very important role in multiphase flow R & D communities as the world's largest conference on multiphase flow. ICMF will provide you with state-of-the-art knowledge on all the aspects of multiphase flow, a good chance of deepening a friendship and research collaboration, and new beginnings as well!

We are looking forward to welcoming you in Kobe!

On behalf of the Organizing Committee,

Akio Tomiyama, Conference chairperson

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Plenary Lectures

Rodney O. Fox (Iowa State University)

Recent Advances in Well-posed Eulerian Models for Polydisperse Multiphase Flows

Polydisperse multiphase flows arise in many applications, and almost always involve a disperse phase with particles of different sizes, compositions, etc., present over a wide range for volume fractions. In this presentation, I will review recent advances in combining quadrature-based moment methods with a well-posed Eulerian two-fluid model derived from a kinetic theory that includes mass and velocity distributions. This approach relies on formulating a disperse-phase kinetic equation valid from close-packed to dilute conditions, coupled to a modified Navier-Stokes equation for the continuous phase. A critical component of the computational approach for treating polydispersity is the formulation of the numerical fluxes for the mass-velocity moments found from the kinetic equation. For the mass moments, the recently developed generalized quadrature method of moments provides a robust reconstruction of the mass distribution. Then, using the conditional and hyperbolic quadrature method of moments for the mass-conditioned velocity moments of the disperse phase, well-posed spatial fluxes are formulated and implemented in a hyperbolic flow solver. Through numerical examples, we demonstrate that by including added mass and pseudoturbulence, this well-posed modeling approach extends to polydisperse flows with arbitrary material density ratios (e.g., bubbly flows).

Professor Fox joined Iowa State University as the Glenn Murphy Professor of Engineering in 1999, and was the Herbert L. Stiles Professor of Chemical Engineering from 2003-2012. He was promoted to Distinguished Professor in Engineering in 2010. Fox has held visiting professorships in Belgium, Denmark, France, Italy, Switzerland and The Netherlands. From 1987-88, he was a NATO Postdoctoral Fellow at LSGC in Nancy, France. His numerous professional awards include a NSF Presidential Young Investigator Award in 1992 and the ISU Outstanding Achievement in Research Award in 2007. From 2012-14, he was a Marie-Curie Senior Fellow at the Ecole Centrale in Paris, France. In 2015 he was selected as an International Francqui Professor by the Francqui Foundation in Belgium, and awarded a Chaire d'Attractivité at the Université Fédérale Toulouse Midi-Pyrénées, France. In 2016 he was selected for the North American Mixing Forum Award for Excellence and Sustained Contributions to Mixing Science and Practice, and the Shell Particle Technology Forum Thomas Baron Award. In 2022 he was named the Fulbright-Tocqueville Distinguished Chair and D'Alembert Senior Fellow at the University of Paris-Saclay, CentraleSupélec. Professor Fox is a Fellow of the American Physical Society and of the American Institute of Chemical Engineering. Professor Fox has made numerous ground-breaking contributions to the field of multiphase and reactive flow modeling. The Fox group spearheaded many fundamental advances in the development of novel computational fluid dynamics (CFD) models to overcome specific scientific challenges faced in the chemical and petroleum industries. He developed powerful quadrature-based moment methods (CQMOM, GQMOM, HyQMOM) for treating distribution functions (particle size, bubble size, velocity, etc.). The impact of Fox's work extends far beyond chemical engineering and touches every technological area dealing with turbulent flow and chemical reactions. His first book, Computational Models for Turbulent Reacting Flows, published by Cambridge University Press (CUP) in 2003, offers an authoritative treatment of the field. His second CUP book in 2013, Computational Models for Polydisperse Particulate and Multiphase Systems, provides a comprehensive treatment of CFD model for disperse multiphase flows. His current research is focused on well-posed multifluid models for polydisperse systems and multiphase turbulent flows.

Melany L. Hunt (California Institute of Technology)

Experiments and Modeling of Liquid-Solid Flows with Inertia

Nearly 70 years ago, R.A. Bagnold published his seminal findings on the rheological properties of liquid-solid suspensions. The Bagnold work provided the basis for many granular and particle flow studies on the transition from the viscous regime to a grain-inertia regime that involves particle collisions; an analysis of the experiments, however, showed the transition was a result of a turbulent transition rather than a transition involving particle collisions. This presentation overviews other studies on the rheology of liquid-solid flows and presents new results from experiments at Caltech. The new experiments involve a coaxial cylindrical rheometer and use the Reynolds number based on particle diameter and the velocity of the moving wall and not on the square of the particle diameter and the shear rate. For Reynolds numbers greater than 10, the effective viscosity shows a linear increase with Reynolds number for solid fraction less than 40%; this increase results from inertial effects and not from particle-to-particle collisions. At higher sheer rates, the flow can transition to turbulence with smaller particles suppressing the transition and larger particles enhancing the turbulence. Additional experiments also consider cases with unmatched densities between the fluid and solid phases. The results are compared with recent numerical simulations using the diameter-based Reynolds number.

Melany L. Hunt is the Dotty and Dick Hayman Professor of Mechanical Engineering. Her research work involves transport and mechanics in multiphase systems, including granular material flows, dense liquid-solid flows, fluidized beds, powders, and booming sand dunes. She received her bachelor's degree from the University of Minnesota, Minneapolis and her masters and doctorate from the University of California, Berkeley. At Caltech she has served in a variety of roles, including executive officer of mechanical engineering and vice provost. She has won awards for teaching, research, and mentoring, including Caltech's 2019 Richard P. Feynman Teaching Prize and the 2022 Agent of Change Award for her efforts around diversity, equity, and inclusion. She was recently elected vice chair of the US National Committee on Theoretical and Applied Mechanics of the National Academies.

Frédéric Risso (Institut de Mécanique des Fluides de Toulouse)

On the Fluctuations Generated by a Dispersed Phase

The understanding of the random fluctuations generated by the motion of a population of bodies dispersed in a fluid is a fundamental issue for many multiphase configurations, including bubbly flows, droplet emulsions and particulate flows. In this talk, we mainly focus on inertial situations where a wake develops at the rear of the dispersed bodies. From the examination of gravity-driven flows (bubble columns and fluidized beds), the singular properties of the body-induced fluctuations, in terms of statistical moments and spectra, is revealed. It turns out that the dynamics of these fluctuations emerge from collective effects and cannot be derived from the dynamics of a single, or a few, particles. They can neither be understood in the framework of single-phase turbulence. The aim of this lecture is to present the concepts that have been introduced to understand the mechanisms responsible for various specific features, such as anisotropy, exponential tails of probability density functions, and k-3 spectral subrange. The relative importance of each mechanism with the volume fraction, the Reynolds number and the nature of the dispersed bodies will also be discussed, as well as the modeling of the body-induced agitation and its interaction with single-phase flow turbulence.

Frédéric Risso (56 years) is a senior researcher at the CNRS (French National Center for Research). He received his PhD in Fluid Dynamics in 1994 from the National Polytechnique Institute of Toulouse and has been studying multiphase flows at IMFT (Institute of Fluids Mechanics of Toulouse) since then. His research is structured around two main axes: Agitation, mixing and transfers in bubbly flows, droplet emulsions and dense suspensions; Dynamics of fluid interfaces (deformation, breakup and coalescence) involving complex interfacial rheology due to the presence of surfactants or membranes. In this context, he particularly focuses on the understanding of fundamental physical mechanisms from the analysis of original experiments and simulations, with the aim to develop models for applications to chemical processes, geophysics and biological flows. He has published 78 articles in peer-reviewed journal (Google scholar page), supervised 17 PhD and 13 postdocs, and be associated editor of the Int. J. Multiphase Flow (2010-2016).

Shu Takagi (The University of Tokyo)

Dynamics of a Rising Bubble and Bubble Cluster

The behaviors of a single bubble and bubble clusters are drastically changed by small amounts of surfactant. It is well-known that a bubble in aqueous surfactant solution rises much slower than one in purified water. This phenomenon is explained by the so-called Marangoni effect caused by a nonuniform concentration distribution of surfactant along the bubble surface. More interestingly, this Marangoni effect also influences the lateral migration in the presence of mean shear. These phenomena influence the multiscale nature of bubbly flows and cause a drastic change in the large scale bubbly flow structures. In the present talk, bubble clustering phenomena in upward bubbly channel flows are discussed with the emphasis on the detail description of single bubble behaviors and bubble-bubble interactions. The direct numerical simulations and the PIV measurement were conducted to clarify the spatiotemporal change of flow structures. It is shown that large scale turbulent vortical structures disappears by suppressing the growth of a small vortical structure near the wall, where the quasi 2-dimensional bubble clusters are passing by.

Shu Takagi is a Professor at the Department of Mechanical Engineering and Department of Bioengineering, The University of Tokyo since 2010. He received Doctor of Engineering from the University of Tokyo in 1995. His areas of expertise include numerical simulations and experimental investigations on dispersed multiphase flows, especially bubbly flows and blood cell flows, medical ultrasound, hierarchical integrated simulation of human body, molecular thermo-fluid mechanics and multiscale analysis of thermo-fluid phenomena. He has written over 20 review articles including Annual Review of Fluid Mechanics and has given more than 30 keynote lectures in conferences. He has been contributing as an associate editor of IJMF and journal FLOW. He is currently the President of Japan Society of Multiphase Flows and the vice President of Japan Society of Fluid Mechanics. He is also a IUTAM Congress Committee member and contributing for the international activity in the field of mechanics.

Keynote Lectures

Tatiana Gambaryan-Roisman (Technical University of Darmstadt)

Interaction between Spreading, Imbibition and Evaporation of Drops on Heated Substrates with Porous Coatings

Heat and mass transport during drop impact or a gentle deposition onto a heated substrate depends on the surface chemistry, morphology, thermal and mechanical properties of the substrate, as well as on the substrate temperature. In particular, if a substrate is coated with a porous layer of a wettable material, the drop spreading is accompanied by the imbibition of a liquid into the layer. The wetted area is significantly enhanced in comparison with the area which can be covered by a drop spreading over a bare substrate. As a result, the liquid evaporation rate increases and the evaporation time decreases. Understanding the interaction between the liquid spreading, imbibition and evaporation is important both for enhancement of heat transfer in cooling applications and for functionalizing of porous media. In our experimental studies, substrates manufactured from an infrared-transparent calcium fluoride glass are used. The substrates are coated with a submicrometer black CrN layer and an electrically conductive chromium layer, which is used for heating of the substrate by electrical current. Nanofiber coating layers are applied on top of a chromium layer using electrospinning. The dynamics of drop spreading is captured by a high-speed camera in a side view, the imbibition is observed with a top view camera, and the temperature distribution at the substrate-coating interface is captured by an infrared camera. Based on the transient temperature field, heat flux distribution is determined. The detailed analysis of the experimental data for different thicknesses of the porous layers, different substrate temperatures and different liquids sheds a light on the coupled transport processes.

Tatiana Gambaryan-Roisman received a Master of Science and Doctor of Science degrees in Mechanical Engineering from the Technion – Israel Institute of Technology. She worked as a postdoctoral fellow at the Institute of Glass and Ceramics, University of Erlangen-Nuremberg and after that changed to the Institute of Technical Thermodynamics at the Department of Mechanical Engineering, Technical University of Darmstadt, where she defended a Habilitation thesis in 2008 and was promoted to Apl. Professor in 2015. In 2002, Tatiana Gambaryan-Roisman was enrolled in the Emmy Noether-Program of German Research Foundation (DFG) and founded a Junior Research Group ”Evaporation of thin films from structured surfaces”. She was one of the founding members of the Excellence Cluster ”Center of Smart Interfaces: Understanding and Designing Fluid Boundaries” (CSI) established at TU Darmstadt. In the years 2014-2017 T. Gambaryan-Roisman has coordinated the Marie Curie Initial Training Network ”Complex wetting Phenomena” (CoWet). She is currently coordinating an Innovative Training Network ”Dynamics of dense nanosuspensions: a pathway to novel functional materials” (nanoPaInt). Tatiana Gambaryan-Roisman heads the research group ”Interfacial transport and complex wetting” at the Institute for Technical Thermodynamics at the Technical University of Darmstadt.

Yuji Tasaka (Hokkaido University)

Ultrasonic Spinning Rheometry Test for Multiphase Flow Studies

Ultrasonic spinning rheometry (USR), which utilizes velocity profile information of cylindrical shear flows measured by ultrasonic velocity profiling (UVP) to determine rheological properties of complex fluids, has been established for evaluating effective viscosity of bubbly liquids in unsteady shear flows simulating shear environment in turbulent boundary layers. USR has high applicability for general multiphase fluids including, for example, fluid foods, which are out of range of evaluations by conventional rheometers utilizing axial torque measurement. Analysis using instantaneous velocity profiles determined by UVP on the equation of motion allows to evaluate local effective values of rheological properties such as shear-dependent viscosity and viscoelasticity at local share rates unlike apparent viscosity for a bulk shear rate evaluated by the conventional rheometers. In this talk, principle of USR and two different analyses, effective viscosity analysis and local linear viscoelastic analysis, are summarized, and efficacy of the methods are explained. Following practical applications of USR for general complex fluids including an oil-water mixture, recent findings on rheological properties of suspensions under unsteady shear through the measurement on bubbly liquid, particle suspensions, and slurries are introduced.

He finished his Ph.D. project entitled “Natural convection induced by internal heat source” in Graduate School of Engineering, Hokkaido University in 2005. After the Ph.D. course he took assistant professor position following two-years research associate contract in the same school. Later in 2011 he has been promoted to associate professor in the research group of Laboratory for Flow Control in Hokkaido University. He also had

oversea research experiences in University of Manchester (2008), Helmholtz Centre at Dresden-Rossendorf (2016), and University of Normandy (2017) as a visiting (guest) researcher. His original research interests are flow transition phenomena including natural convections, and developments of measurement tools for this purpose. And recently, the interests have been extended to flow transitions in multiphase media as a frontier of the classical research topics, with development of ultrasonic spinning rheometry.

Dieter Bothe (Technical University of Darmstadt)

Mass Transfer across Actual Fluid Interfaces – Modeling and Simulation

Fluid interfaces, such as bubbles, droplets, and liquid films that are out of chemical equilibrium irreversibly exchange mass. These interfaces, as part of real-world multiphase fluid systems, feature many complexities that make them challenging to study. Firstly, the fluid interface is a free, moving, and deformable phase boundary, making the problem inherently nonlinear and geometrically difficult. Introducing surface tension and the related pressure jump, the fluid interface renders the numerical treatment non-trivial even for pure fluids, especially if high density and/or viscosity ratios are present. If the fluid interface carries adsorbed molecules, the resulting Marangoni stresses add further nonlinearities to the system, resulting for instance in non-monotonic rise behavior. The bulk phases can also lead to complications. For example, in the case of gas bubbles, the ambient liquid is often a multicomponent mixture containing ionic constituents in polar liquids such as water, resulting in intrinsic electrical effects and/or non-Newtonian rheological behavior due to dissolved macromolecules such as polymers. The diffusive transport of solutes is characterized by high Schmidt numbers, often resulting in large Péclet numbers at moderate to large Reynolds numbers. This leads to extremely fine concentration boundary layers, of a thickness possibly down to the Bachelor length scale, requiring specific techniques for accurate numerical treatment, a challenge further tightened if fast chemical reactions occur. For complex liquids with, say, viscoelastic behavior, the interaction between the fluid interface, acting as an obstacle for the flow kinematics, with the liquid elasticity leads to surprising phenomena like negative wakes, cusp formation, and the well-known velocity jump discontinuity. In comparison to this, the gas phase description is not too involved with possible cross-diffusion and, more demanding, compressibility effects during longer bubble rise. Coming back to contamination by surfactants, the adsorption of surfactant strongly influences local mass transfer rates of, e.g., gaseous components into a liquid phase. Even for stagnant fluids, the partial coverage of the interface with surfactant molecules constitutes a barrier to mass transfer. The talk will provide an in-depth survey of the state of the art of local mass transfer modeling and computation at actual fluid interfaces, with a focus on recent work on subgrid-scale modeling and the interplay of surfactants and interfacial mass transfer.

Dieter Bothe is a full Professor at TU Darmstadt and head of MMA, the Mathematical Modelling and Analysis lab. He studied math/computer science/physics at U Paderborn, where he graduated in 1993 and obtained his habilitation in mathematics in 2000. From 1999 to 2005, he was head of the group Modelling, Analysis and Simulation of Multiphase Flows at the Institute for Chemical Engineering at U Paderborn. From 2005 to 2009, he held the Chair for Mathematics/CCES at RWTH Aachen. From 2006 he was Co-Director of the Center for Computational Engineering Science there until he accepted a research professorship at TU Darmstadt/Center of Smart Interfaces in 2009. He is an associated editor of the international journal ”Nonlinear Analysis: Real World Applications” and serves on the editorial advisory board of the ”International Journal of Multiphase Flow”. From 2010 to 2017, he was coordinator of the DFG-Priority Programme SPP 1506 ”Transport processes at fluid interfaces” and currently is vice coordinator of the DFG-CRC 1194 ”Interaction between Transport and Wetting Processes”. In 2017 he was assigned as member of the Scientific Advisory Council of TU Darmstadt. Since 2021, he is coordinator of the research profile Topic ”Thermo-Fluids & Interfacial Phenomena”. His research comprises nonlinear evolution equations, reaction-diffusion bulk-surface systems and transport processes in two-phase flows, where he combines fundamental modeling with mathematical analysis and numerical simulations to analyze, describe and understand processes in the Natural and Engineering Sciences.

Arezoo Ardekani (Purdue University)

Rheology of Concentrated Suspension of Particles

Controlling the flow of concentrated particle suspensions is a crucial piece of an unresolved puzzle in many applications, e.g., biofuel production, solar cells, electronic cooling, fiber-reinforced thermoplastics. Unravelling the underlying physics and governing mechanisms that determine such materials' behavior is thus crucial. Understanding the flow behavior, quantifying the particle microstructure, and exploring ways to manipulate it in suspensions are essential to increase the efficiency and throughput of processes involving such dense suspensions of particles. Accurate predictions of rheology provide control over the flow of these materials. We developed experimentally validated and physics-based computational approach to study the flow of dense suspensions near jamming limits and quantitatively determined the role of inter-particle short range interactions on the rheology, the jamming fraction, and the microstructure of dense suspensions.

Dr. Ardekani is a Professor of Mechanical Engineering at Purdue University. Honored with the Presidential Early Career Award for Scientists and Engineers (PECASE) from President Obama, Arezoo has also received an NSF CAREER Award, the Arthur B. Metzner Early Career Award from the Society of Rheology, the Society of Engineering Science Young Investigator Medal, the Sigma Xi Mid-career Research Award, and is named a Purdue University Faculty Scholar. A Fellow of American Physical Society (APS) and American Society of Mechanical Engineers, Arezoo has also received the College of Engineering Faculty Excellence Awards for Graduate Student Mentorship and Early Career Research, the Amelia Earhart Award, and the Society of Women Engineers Award. She received her PhD from University of California Irvine in 2009 and was a Shapiro Postdoctoral Fellow at MIT. Arezoo is an Associate Editor of ASME Applied Mechanics Review, an Editorial Advisory Board Member of International Journal of Multiphase Flow, Journal of Non-Newtonian Fluid Mechanics, Physics of Fluids and Physical Review Fluids and a member of the American Physical Society-Division of Fluid Dynamics (DFD) Executive Committee. She was a co-chair of APS-DFD meeting held in Indianapolis this year.

Panagiota Angeli (University College London)

Drop Formation in Microfluidic Channels in the Presence of Surface Active Agents

Dispersions/emulsions of two immiscible liquids find numerous applications in pharmaceutical and healthcare formulations, food and agrochemicals. In recent years, microchannels have been extensively used to produce emulsions with small, uniform drop sizes. Surfactants and colloidal particles are commonly added to vary the interfacial properties, control the drop size, stabilise the emulsions and influence the final product rheology. The drop size is determined by the droplet break up in the microfluidic channels which is linked to interfacial properties such as interfacial tension and rheology. These depend on the absorption and distribution of the surface active agents to the forming interfaces. Often with surfactants, equilibrium values of interfacial tension are used to correlate the results. As interfaces expand, deform or break up, the interfacial surfactant concentrations will diverge from the equilibrium values, while concentration gradients can also appear, giving rise to Marangoni stresses. In addition, the presence of colloidal particles affects interfacial rheology and drop break up. In the talk, I will discuss the flow patterns and dynamic phenomena occurring during drop formation and break up in microfluidic channels in the presence of surface active agents. The various stages of drop formation will be presented alongside the interface deformation and the local velocity fields, obtained with high sped imaging and particle image velocimetry and complemented by computational fluid dynamics simulations. The distribution of surface active agents at the interfaces is also visualized with fluorescence techniques.

Prof Panagiota Angeli, FIChemE, is a Professor in the Department of Chemical Engineering at UCL, Deputy Head ED&I, and leads the ThAMeS Multiphase group. She obtained a Diploma in Chemical Engineering from the National Technical University of Athens and a PhD on Multiphase Flows at Imperial College London. She specializes on complex multiphase flows particularly those involving two liquid phases. Her research aims to link small scale interactions and interfacial phenomena to the macroscopic behaviour of the complex flows and to the development of predictive models. She has been investigating the effects of surfactants, particles and non-Newtonian rheologies on two-phase microchannel flows, as well as their applications to the analysis and intensification of metal separations, and to the manufacturing of complex formulations. The experimental investigations have been enabled by original and advanced sensing and measurement techniques, such as micro- and high speed Particle Image Velocimetry (PIV) and ultrasound. Prof Angeli's work has been supported by substantial UK Research Council and European Union grants and by industry. She has been awarded a RAEng/Leverhulme Trust Fellowship, and has participated and chaired UK EPSRC and international (Norway,

Sweden, Ireland, Belgium) research funding review panels. She co-chairs the Multiphase Flows Special Interest Group of the EPSRC funded UK Fluids Network and has published about 200 journal papers.

Zhaosheng Yu (Zhejiang University)

Turbulence Modulation by Heavy Finite-size Particles in Vertical Channel Flows and Development of Two-fluid Models from Interface-Resolved Simulations

In this talk, I introduce our recent works on the particle-turbulence interactions in vertical channel flows and the development of related multiphase flow models based on interface-resolved direct numerical simulations. First, the results on the modulation of turbulence intensity by heavy finite-size particles in upward channel flow at different particle Reynolds numbers, bulk Reynolds numbers, particle sizes, density ratios and particle volume fractions are presented. The criteria of the turbulence enhancement or attenuation are provided for the total turbulence intensity in the channel and the turbulence intensity at the channel center, respectively, and both are shown to agree well with the experimental data in the literature. Then, new drag correlations are developed based on our DNS data of particle sedimentation in a periodic domain and upward turbulent channel flows. A drift velocity model is established to obtain the effective slip velocity from the interphase mean velocity difference for the vertical turbulent channel flow. Finally, correlations for the interfacial terms in the fluid Reynolds stress equations and the dissipation rate equation are established for particle-laden flows based on our DNS data of particle sedimentation in a periodic domain. The results show that the Reynolds stress model with the proposed interfacial term correlations can quantitatively predict particle-induced turbulence enhancement or suppression in vertical channel flows.

Zhaosheng Yu is currently a professor in the department of Mechanics at Zhejiang University. He received the B.S. and M.S. degrees from Zhejiang University, China, in 1996 and 1999, respectively, and the Ph.D. degree from the University of Sydney, Australia, in 2004. He was a Postdoctoral research fellow in the University of Twente, Netherlands, and then in IFP, France, from 2003 to 2006. He has been working at Zhejiang University since 2006, and was promoted to associate and full professor in 2006 and 2012, respectively. He serves as head of the Fluid Engineering Institute at Zhejiang University and head of the multiphase flow professional group in Chinese Society of Theoretical and Applied Mechanics. His current research interests include the mechanisms and modeling of the multiphase flows based on fully-resolved direct numerical simulations. He has published more than 90 peer-reviewed papers (including 15 JFM papers) with over 2800 Google scholar citations.

Jochen Fröhlich (Technische Universität Dresden)

Simulation of Particle-laden Flows in Microfluidic Channels

Since the development of microfluidics large efforts have been made to develop tools for the separation of micro-particles from highly concentrated polydisperse suspensions, as observed in blood samples, aiming at disease diagnostics and cell research, for example. From the different available approaches, inertial migration allows the passive, non-labelling continuous processing of large samples of non-buoyant particles by migration to specific locations in the cross section. While flows with low concentration of spherical particles in straight ducts are understood, present challenges result from duct curvature, non-spherical particle shapes, increased concentration, and polydispersity. Fully resolved transient numerical simulations of these processes are employed to investigate these phenomena. In a first part of the talk the physical and numerical modelling procedure will be described. The presentation will then overview recent simulations of such flows addressing the implications of the respective effects. While flow curvature, as generated in microfluidic spirals, for example, enhances focusing through the induced Dean flow, non-spherical particle shapes tend to change the performance of the focusing process by modifying the resulting focusing positions. Furthermore, even at relatively low concentration interactions between the particles can degrade the focusing performance. At higher concentrations the effect is stronger and eventually results in only weak segregation. Polydisperse samples present particular effects resulting from variation of forces with size and displacement of small particles by large ones. The simulation method and the results obtained are relevant for designing corresponding devices.

Jochen Fröhlich studied Mechanical Engineering at RWTH Aachen where he received a diploma degree. Funded by a scholarship of CNRS, he then worked at the University of Nice – Sophia-Antipolis, France where he obtained a PhD in Engineering Sciences. After two post-doctoral positions at the University of Kaiserslautern and Konrad-Zuse-Zentrum Berlin, he moved to the University of Karlsruhe (TH), nowadays KIT, where he submitted

his habilitation thesis on Large Eddy Simulation in 2004. Since 2007, Jochen Fröhlich is holding the Chair of Fluid Mechanics at Technische Universität Dresden and since 2010 he is Managing Director of the Institute of Fluid Mechanics at this university. His research interests cover numerical methods, high-performance computing, modelling and simulation of turbulent and multiphase flows, as well as fluid-structure interaction. He received the Harold Schoemaker Award of the International Association for Hydro-Environment Engineering and Research for work on particle-resolved simulations of sediment transport.

Kosuke Hayashi (Kobe University)

Lift Correlations of Ellipsoidal Bubbles in Low and High Viscosity Liquids

Auton (1987) derived the lift coefficient of a spherical bubble at infinite bubble Reynolds number from the distribution of vorticity affected by a weak incident shear flow. Legendre and Magnaudet (1998) then proposed a lift correlation for finite Reynolds numbers, in which the viscous contribution decreases the lift coefficient and its functional form is similar to that of the drag coefficient. Legendre (2007) pointed out the relation between the vorticity generated at the bubble surface and the drag. This keynote lecture introduces a modelling of the lift coefficient of ellipsoidal bubbles, which experience negative lift due to shape deformation, by connecting the drag expressed in terms of the vorticity and the negative lift component. This strategy works well both for bubbles in viscous liquids and those in water. The critical bubble diameter for lift reversal will then be discussed using the developed lift correlations. The Ohnesorge and capillary numbers are good candidates to express the critical diameter in low and high viscosity liquids, respectively, and, interestingly, the critical diameter lies within a narrow range, i.e., 3 to 5 mm, for a wide range of the Morton number. The effects of surfactant on the lift coefficient will also be discussed. This research series has been carried out in a collaboration between IMFT (Prof. D. Legendre), HZDR (Dr. D. Lucas and Dr. H. Hessenkemper), and Kobe University (Profs. A. Tomiyama and Hayashi).

Kosuke Hayashi is an associate professor at the Graduate School of Engineering, Kobe University, Japan, since 2012. He received Doctor of Engineering from Kobe University in 2007. He was formerly an assistant professor (2007-2008), then lecturer (2008-2009) at the Kobe City College of Technology, and assistant professor at Kobe University (2009-2012). His research interests include experiments and numerical simulations of bubbles and drops, and effects of surface-active agents on the bubble and drop dynamics, especially the drag and lift forces. He has published 120 peer-reviewed journal papers and devoted two chapters in Encyclopedia of Two-Phase Heat Transfer and Flow III, Macro and Micro Flow Boiling and Numerical Modeling Fundamentals (2018).

Marco da Silva (Johannes Kepler University Linz)

Multi-dimensional Electrical Impedance Sensors for Multiphase Flow Investigation

Multiphase flow research inevitably requires flow experiments commonly performed in small and medium scale test facilities. More and more, multi-dimensional and non- or minimal invasive measurement and sensors are needed to generate accurate data which in turn support (CFD) flow model development and validation. For this reason, in the past a number of sensors and instrumentation to monitor multiphase flow have been developed. Electrical impedance sensors, in which the measurand causes a variation of an electrical property such as resistance or capacitance, have been successfully applied for the measurement of flow parameters in multiphase mixtures. In this talk, an overview on selected impedance-based measurement techniques and sensors applied to the monitoring of multiphase pipe flows is given. Different sensors, instrumentation and data processing techniques are presented as well as some applications are shown. Hence, beginning with simple impedance probes up to tomographic (multi-electrode) sensors along with some current trends for the further development and optimization of this versatile measurement technique will be described and discussed.

Marco Da Silva received the Dr.-Ing. degree in Electrical Engineering from Dresden University of Technology, Germany, in 2008. Between 2004 and 2009, he worked as a Research Associate at Helmholtz-Zentrum in Dresden-Rossendorf, Germany. In 2010, he joined the UTFPR in Brazil, holding the positions as Assistant and from 2013 until 2022 as Associate Professor at the Department of Electrical and Computer Engineering (CPGEI). Between 2017 and 2022, he also served as Deputy Head of the Multiphase Flow Center at UTFPR. Professor Da Silva has been the Head of the Institute of Measurement Technology at the Johannes Kepler University Linz, Austria since October 2022, conducting research and teaching at the Department of Mechatronics. His research interests include measurement technology, sensors, and instrumentation applied to industrial processes and in

special to multiphase flow monitoring. He has authored/co-authored over 200 scientific articles and conference papers and holds five patents.

Shuichiro Miwa (The University of Tokyo)

The Role of Nuclear Thermal-hydraulics towards Carbon Neutrality: from Drift-flux Model to Deep Learning

In analyzing gas-liquid two-phase flow, which consists of various spatio-temporal scales in a complex manner, it is necessary to utilize appropriate analysis methods and models depending on the length scale of the target. In the past 50 years, research in nuclear thermal-hydraulics has contributed considerably to gas-liquid two-phase flow modeling, ranging from Zuber's Drift-flux model to Ishii's two-fluid model and interfacial area transport and so on. Furthermore, a recent trend in data-driven modeling approaches, including deep learning, shows quite promising performance in interpreting the complex nature of two-phase flow structure in a completely new way. In this keynote lecture, the presenter's recent research on tight-lattice rod-bundle two-phase flow, flow-induced vibration, and flow regime identification method using machine learning will be introduced in various modeling approaches.

Shuichiro Miwa is an associate professor at the Nuclear Professional School at the University of Tokyo. He was born in Kobe, Japan, and spent 12 years in Seoul, Korea, since elementary school. He obtained his B.S. in Civil/ Environmental Engineering, M.S., and Ph.D. in Nuclear Engineering from Purdue University, with research in two-phase flow-induced vibration under the supervision of Profs. Takashi Hibiki and Mamoru Ishii. After obtaining his Ph.D. in 2012, he held the position of assistant professor and then associate professor at Hokkaido University. He has held his present position since 2021. His research interests span fundamental two-phase flow experiments and modeling, reactor safety, an adaptation of machine learning towards thermal-hydraulics, and Fukushima Daiichi decommissioning.

Scientific Topics

- **Bio-Fluids**
- **Bubbly Flows**
- **Cavitation/Nucleation**
- **Collision, Agglomeration and Breakup**
- **Colloidal and Suspension Dynamics**
- **Computational Techniques for Multiphase Flows**
- **Droplet Flows**
- **Environmental and Geophysical Flows**
- **Experimental Methods for Multiphase Flows**
- **Fluid-Structure Interactions**
- **Interfacial Flows**
- **Instabilities**
- **Mixing**
- **Modelling of Multiphase Flows**
- **Multiphase Flow in Heat and Mass Transfer**
- **Non-Newtonian Multiphase Flows**
- **Particle Dynamics**
- **Particle-Laden Flows**
- **Reactive Multiphase Flows**
- **Turbulence in Multiphase Flows**

Organized Sessions

- **Industrial Applications**
  Organizers: Isao Kataoka (Institute of Nuclear Safety System, Japan), Xiaodong Sun (University of Michigan, USA), Hyoung Kyu Cho (Seoul National University, Korea), Shuichiro Miwa (The University of Tokyo, Japan)

- **Boiling, Condensation, Evaporation**
  Organizers: Shoji Mori (Kyushu University, Japan), Matteo Bucci (Massachusetts Institute of Technology, USA), Hiroyasu Ohtake (Kogakuin University, Japan), Niro Nagai (Fukui University, Japan)

- **Bubbles and Drops**
  Organizers: Toshiyuki Sanada (Shizuoka University, Japan), Minori Shirota (Hirosaki University, Japan), Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology, Japan), Chao Sun (Tsinghua University, China), Kirti Chandra Sahu (IIT Hyderabad, India), Tuan Tran (Nanyang Technological University, Singapore)

- **Fluidization**
  Organizers: Takuya Tsuji (Osaka University, Japan), Wei Wang (Chinese Academy of Sciences, P.R. China), Daniel Holland (University of Canterbury, New Zealand), Alberto Di Renzo (University of Calabria, Italy)

- **Granular Flow**
  Organizers: Takuya Tsuji (Osaka University, Japan), Maxime Nicolas (Aix Marseille University-CNRS, France), Hiroaki Katsuragi (Osaka University, Japan)

- **Numerical Modeling of Granular and Multiphase Flows**
  Organizers: Mikio Sakai (The University of Tokyo, Japan), Toru Ishigami (Hiroshima University, Japan), Shunying Ji (Dalian University of Technology, China), Kun Luo (Zhejiang University, China), Wei Wang (Chinese Academy of Sciencies, China)

- **Two-phase Flow Systems under Microgravity**
  Organizers: Hitoshi Asano (Kobe University, Japan), Catherine Colin (University of Toulouse, France), Paolo di Marco (University of Pisa, Italy), Jungho Kim (University of Maryland, USA), Osamu Kawanami (University of Hyogo, Japan), Atsushi Okamoto (JAXA, Japan)

- **Micro- and Nano-Scale Multiphase Flows**
  Organizers: Akimaro Kawahara (Kumamoto University), Masahiro Kawaji (City College of New York, US), Martin Wörner (Karlsruhe Institute of Technology, Germany), Mirco Magnini (University of Nottingham, UK), Masahiro Takei (Chiba University), Ryo Kurimoto (Kobe University)

- **Fundamentals and Applications of Fine Bubble Technology**
  Organizers: Hisato Minagawa (The University of Shiga Prefecture, Japan), Takayuki Suzuki (Kobe City College of Technology, Japan), Koichi Terasaka (Keio University, Japan), Michael Schlüter (Hamburg University of Technology, Germany), Shigeo Hosokawa (Kansai University, Japan), Adam Donaldson (Dalhousie University, Canada), Takashi Hata (National Institution of Technology, Kochi College, Japan), Adel Al-Taweel (Dalhousie University, Canada)

Conference Schedule

PL: Plenary lectures

KL: Keynote lectures

SA, JA: Senior and Junior award lectures

S: Technical sessions in parallel

P: Poster session with beer

CB: Coffee break

Sunday, April 2, 2023

Registration 16:00−19:30 Registration Desk at Conference Center

Reception 18:30−20:30 OWADA, Portopia Hotel

Monday, April 3, 2023

Opening and Governing Board Sessions 9:30−10:00 Main Hall

(Plenary Lecture) **Rodney O. Fox (Iowa State University)** Recent Advances in Well-posed Eulerian Models for Polydisperse Multiphase Flows, 10:00−10:50, Main Hall

—— Coffee Break ——

(Keynote Lecture) **Tatiana Gambaryan-Roisman (Technical University of Darmstadt)** Interaction between Spreading, Imbibition and Evaporation of Drops on Heated Substrates with Porous Coatings, 11:10−11:50, Main Hall

(Keynote Lecture) **Yuji Tasaka (Hokkaido University)** Ultrasonic Spinning Rheometry Test for Multiphase Flow Studies, 11:10−11:50, Room 301

—— Lunch Break (Ariston Hotel Kobe) ——

Technical Session S1 13:00–14:40

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle Dynamics	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Industrial Apps.	Collision, Agglomeration and Breakup	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Interfacial Flows	Non-Newtonian Multiph. Flows

—— Coffee Break ——

Technical Session S2 15:00–16:20

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle Dynamics	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Industrial Apps.	Collision, Agglomeration and Breakup	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Interfacial Flows	Non-Newtonian Multiph. Flows

Poster Session with Beer 16:20–17:40 Reception Hall

Tuesday, April 4, 2023

(Plenary Lecture) **Melany L. Hunt (California Institute of Technology)** Experiments and Modeling of Liquid-Solid Flows with Inertia, 9:00–9:50, Main Hall

(Keynote Lecture) **Dieter Bothe (Technical University of Darmstadt)** Mass Transfer across Actual Fluid Interfaces – Modeling and Simulation, 10:00–10:40, Main Hall

(Keynote Lecture) **Arezoo Ardekani (Purdue University)** Rheology of Concentrated Suspension of Particles, 10:00–10:40, Room 301

—— Coffee Break ——

Technical Session S3 11:00–12:20

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Industrial Apps.	Collision, Agglomeration and Breakup	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Interfacial Flows	Non-Newtonian Multiph. Flows

—— Lunch Break (Ariston Hotel Kobe) ——

(Keynote Lecture) **Panagiota Angeli (University College London)** Drop Formation in Microfluidic Channels in the Presence of Surface Active Agents, 13:30–14:10, Main Hall

(Keynote Lecture) **Zhaosheng Yu (Zhejiang University)** Turbulence Modulation by Heavy Finite-size Particles in Vertical Channel Flows and Development of Two-fluid Models from Interface-Resolved Simulations, 13:30–14:10, Room 301

Technical Session S4 14:20–15:40

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Industrial Apps.	Collision, Agglomeration and Breakup	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Interfacial Flows	Non-Newtonian Multiph. Flows

—— Coffee Break ——

Technical Session S5 16:00–17:40

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Fundamentals and Apps. of Fine Bubble Technol.	Droplet Flows	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Interfacial Flows	Bubbles and Drops (Drops)

Wednesday, April 5, 2023

Gad Hetsroni (Senior) Award Lecture 9:00–9:50, Main Hall

Andrea Prosperetti (Junior) Award Lecture 10:00–10:40 Main Hall

—— Coffee Break ——

Technical Session S6 11:00–12:40

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Numerical Model. of Granular and Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Fluidization	Droplet Flows	Cavitation / Nucleation	Bubbles and Drops (Bubbles)	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

—— Lunch Break (Ariston Hotel Kobe) ——

Technical Session S7 13:50−15:30

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Fluidization	Droplet Flows	Turbulence in Multiph. Flows	Bubbly Flows	Boiling, Conden-sation, Evaporation	Compt. Tech. for Multiph. Flows	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

—— Coffee Break ——

Technical Session S8 16:00−18:00

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Fluidization	Droplet Flows	Turbulence in Multiph. Flows	Bubbly Flows	Boiling, Conden-sation, Evaporation	Compt. Tech. for Multiph. Flows	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

Banquet 19:00−21:00 OWADA, Portopia Hotel

Thursday, April 6, 2023

(Plenary Lecture) **Frédéric Risso (Institut de Mécanique des Fluides de Toulouse)** On the Fluctuations Generated by a Dispersed Phase, 9:00−9:50, Main Hall

(Keynote Lecture) **Jochen Fröhlich (Technische Universität Dresden)** Simulation of Particle-laden Flows in Microfluidic Channels, 10:00−10:40, Main Hall

(Keynote Lecture) **Kosuke Hayashi (Kobe University)** Lift Correlations of Ellipsoidal Bubbles in Low and High Viscosity Liquids, 10:00−10:40, Room 301

—— Coffee Break ——

Technical Session S9 11:00−12:20

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows	Model. of Multiph. Flows	Exp. Meth. for Multiph. Flows	Colloidal and Suspension Dynamics	Fluid-Structure Interactions	Turbulence in Multiph. Flows	Bubbly Flows	Boiling, Condensation, Evaporation	Compt. Tech. for Multiph. Flows	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

—— Lunch Break (Ariston Hotel Kobe) ——

(Keynote Lecture) **Marco da Silva (Johannes Kepler University Linz)** Multi-dimensional Electrical Impedance Sensors for Multiphase Flow Investigation, 13:30−14:10, Main Hall

(Keynote Lecture) **Shuichiro Miwa (The University of Tokyo)** The Role of Nuclear Thermal-hydraulics towards Carbon Neutrality: from Drift-flux Model to Deep Learning, 13:30−14:10, Room 301

Technical Session S10 14:20−15:40

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows	Model. of Multiph. Flows	Reactive Multiph. Flows	Instabilities	Fluid-Structure Interactions	Turbulence in Multiph. Flows	Bubbly Flows	Granular Flow	Mixing	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

—— Coffee Break ——

Technical Session S11 16:00−18:00

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows		Reactive Multiph. Flows	Instabilities	Bio-Fluids	Turbulence in Multiph. Flows	Bubbly Flows	Granular Flow	Mixing	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

Friday, April 7, 2023

(Plenary Lecture) **Shu Takagi (The University of Tokyo)** Dynamics of a Rising Bubble and Bubble Cluster, 9:00–9:50, Main Hall

—— Coffee Break ——

Technical Session S12 10:10–11:50

Room 301	401	402	403	404	405	406	501	502	503	504	505
Particle-Laden Flows	Micro- and Nano-Scale Multiph. Flows	Special Session: Machine Learning for Multiph. Flows	Reactive Multiph. Flows	Instabilities		Environmental and Geophysical Flows	Bubbly Flows	Two-phase Flow Systems under Microgravity	Mixing	Multiph. Flow in Heat and Mass Transfer	Bubbles and Drops (Drops)

Closing 11:50–12:20 Main Hall

Sunday, April 2, 2023

Registration 16:00−19:30 Registration Desk at Conference Center

Reception 18:30−20:30 OWADA, Portopia Hotel

Monday, April 3, 2023

Opening and Governing Board Sessions 9:30−10:00 Main Hall

(Plenary Lecture) **Rodney O. Fox (Iowa State University)** Recent Advances in Well-posed Eulerian Models for Polydisperse Multiphase Flows, 10:00−10:50, Main Hall, Chairperson: Yuichi Murai (Hokkaido University)

—— Coffee Break ——

(Keynote Lecture) **Tatiana Gambaryan-Roisman (Technical University of Darmstadt)** Interaction between Spreading, Imbibition and Evaporation of Drops on Heated Substrates with Porous Coatings, 11:10−11:50, Main Hall, Chairperson: Shu Takagi (The University of Tokyo)

(Keynote Lecture) **Yuji Tasaka (Hokkaido University)** Ultrasonic Spinning Rheometry Test for Multiphase Flow Studies, 11:10−11:50, Room 301, Chairperson: Gretar Tryggvason (Johns Hopkins University)

—— Lunch Break (Ariston Hotel Kobe) ——

S1 Particle Dynamics 13:00−14:40, April 3, Room 301

Session Chair: **Tomoaki Watamura (Kyoto Institute of Technology)**

13:00 #37: Fall of a group of cylinders confined in a thin-gap cell filled with liquid at rest

Dylan Letessier (Institut de mécanique des fluides de Toulouse (IMFT)); Patricia Ern (Institut de mécanique des fluides de Toulouse (IMFT)); Véronique Roig (Institut de mécanique des fluides de Toulouse (IMFT))

13:20 #527: Influence of thermophoretic forces on the nanoparticle production via flame spray pyrolysis

Pedro Bianchi Neto (UNICAMP); **Lizoel Buss** (University Bremen); Udo Fritsching (University Bremen); Dirceu Noriler (UNICAMP)

13:40 #706: Population balance modeling of carbon black formation in flame spray pyrolysis reactors solved by the direct quadrature method of moments

Fabio H Bastiani (UNICAMP); **Pedro Bianchi Neto** (UNICAMP); Udo Fritsching (University Bremen); Dirceu Noriler (UNICAMP)

14:00 #480: Mechanical and fluid-transport properties of fiber networks – fundamental differences between dry and wet networks

Per Bergström (Essity Hygiene and Health AB/Chalmers); **Henrik Ström** (Chalmers); Charlotta Hanson (Essity Hygiene and Health AB); Srdjan Sasic (Chalmers University of Technology)

14:20 #302: Second-order sensitivity matrix electrical impedance tomography (SSM-EIT) with cell-specialized electrical equivalent circuit(cEEC) method to reconstruct image of spatiotemporal transition of intra/extra-cellular ion concentrations

Yiqun Tang (Chiba University); Songshi Li (Chiba University); Daisuke Kawashima (Chiba University); Masahiro Takei (Chiba University)

S1 OS: Numerical Modeling of Granular and Multiphase Flows 13:00−14:40, April 3, Room 401

Session Chair: **Kimiaki Washino (Osaka University)**

13:00 #77: Large eddy simulation of dune evolution by wind erosion, sand transport and depositon

Jian Zhao Wu (LMFA, ECL); **Catherine Le Ribault** (LMFA, ECL, CNRS); Ivana Vinkovic (LMFA, ECL, UCB Lyon1); Serge Simoëns (LMFA, ECL, CNRS)

13:20 #212: One-way analysis for sediment transport process near riverbed based on a grid-averaged Lagrangian model

Takashi Inoue (Tokyo University of Science); Jin Kashiwada (Tokyo University of Science); Yasuo Nihei (Tokyo University of Science)

13:40 #569: Data-driven reduced-order modeling for parameterized multiphase flows in a spouted bed

Shuo Li (the University of Tokyo); Guangtao DUAN (The University of Tokyo); Mikio Sakai (UTokyo)

14:00 #296: Simulation of particle dynamics in mechanofusion device by discrete element method

Wei Pin Goh (University of Leeds); Mojtaba Ghadiri (University of Leeds)

14:20 #113: Numerical simulation of rigid particles in Stokes flow: lubrication correction, including fluid correction, for general shape of particles

Aline Lefebvre-Lepot (CMAP, CNRS, Ecole Polytechnique, I.P. Paris); Flore Nabet (CMAP, Ecole Polytechnique, I.P. Paris)

S1 Modelling of Multiphase Flows 13:00−14:40, April 3, Room 402

Session Chair: **Shu Takagi (The University of Tokyo)**

13:00 #248: Assessment of INSS drift-flux correlation for rod bundle at low-flow and low-pressure conditions

Ikuo Kinoshita (Institute of Nuclear Safety System, Inc.); Takashi Hibiki (City University of Hong Kong); Xiuzhong Shen (KU)

13:20 #237: Development of a diffuse interface methodology in a high-order flux-reconstruction framework

Simon Blanchard (JAXA); Junya Aono (RCCM); Takanori Haga (JAXA)

13:40 #223: Resolved and unresolved: morphology transfers in OpenFOAM-hybrid

Benjamin Krull (Helmholtz-Zentrum Dresden-Rossendorf (HZDR)); Richard Meller (Helmholtz-Zentrum Dresden-Rossendorf (HZDR)); Fabian Schlegel (Helmholtz-Zentrum Dresden-Rossendorf (HZDR)); Matej Tekavčič (Jožef Stefan Institute)

14:00 #516: Interface retaining coarsening of complex multiphase flows

Xianyang Chen (Johns Hopkins University); Jiacai Lu (Johns Hopkins University); **Gretar Tryggvason** (Johns Hopkins University)

14:20 #669: A hybrid solver to resolve strong interactions between liquid films and gas flows

David Barreiro-Villaverde (Universidade da Coruña); **Anne Gosset** (Universidade da Coruña); Miguel A. Mendez (von Karman Institute for Fluid Dynamics); Marcos Lema (Universidade da Coruña)

S1 Experimental Methods for Multiphase Flows 13:00−14:40, April 3, Room 403

Session Chair: **Yasushi Saito (Kyoto University)**

13:00 #461: Cancelled

13:20 #127: Investigation of gas-liquid phase and liquid film thickness irradiated two-fluids jet surface using an optical fiber probe

Shinsuke Watanabe (Shizuoka University); Kensho Yamakawa (Shizuoka University); Yuki Mizushima (Shizuoka University); Hiroki Takahashi (Ebara Corporation); Satomi Hamada (Ebara Corporation); Masayoshi Imai (Ebara Corporation); Toshiyuki Sanada (Shizuoka University)

13:40 #238: Identification method for the thin area of wavy liquid-film with optical waveguide sensors

Kosuke Nakano (Shizuoka University); Yujiro Teramoto (Shizuoka University); Hajime Furuichi (Shizuoka University); Toshiyuki Sanada (Shizuoka University); Yuki Mizushima (Shizuoka University)

14:00 #262: Consideration of accuracy improvement for the film-thickness-measurements via an optical-fiber-based reflective probe during

Daiki Iioka (Shizuoka University); Toshiyuki Sanada (Shizuoka University); Yuki Mizushima (Shizuoka University)

14:20 #767: Experiments for the liquid film in water-air flow in a vertical annulus

P.J. Muis (Delft University of Technology); A.J. Greidanus (Delft University of Technology); J.M.C. van't Westende (Delft University of Technology); **Ruud Henkes** (Delft University of Technology)

S1 OS: Industrial Applications 13:00−14:40, April 3, Room 404

Session Chair: **Boris Balakin (Western Norway University of Applied Sciences)**

13:00 #43: Experimental investigation of the transition between intermittent and annular two-phase flow through orifice plates

Charlie Geest (UNICAMP); **Marcelo S Castro** (UNICAMP)

13:20 #225: Device for applying an ophthalmic medicament mist

Moshe Tshuva (Afeka, Tel-Aviv Academic College of Engineering); Joshua Altman (Afeka, Tel-Aviv Academic College of Engineering)

13:40 #838: Investigation of spreading behavior with fragmentation of a wall-impinging liquid jet in a shallow pool

Naoki Horiguchi (Japan Atomic Energy Agency); Hiroyuki Yoshida (Japan Atomic Energy Agency); Akiko Kaneko (University of Tsukuba); Yutaka Abe (University of Tsukuba)

14:00 #681: Influence of hydrate-like particles on the horizontal three-phase solid-liquid-gas slug flow pattern

Stella Cavalli (NUEM - UTFPR); Vitor O. O. Machado (NUEM); Gianluca Lavalle (Centre SPIN - Mines Saint-Etienne); Moisés Marcelino Neto (NUEM - UTFPR); Amadeu K Sum (Colorado School of Mines); Ana Cameirão (Centre SPIN - Mines Saint-Etienne); **Rigoberto E. M. Morales** (NUEM - UTFPR)

14:20 #22: Influence of the operation conditions and the geometry on the gas entrainment in a sodium fast reactor mock-up

David Guenadou (CEA); Philippe Aubert (CEA), Jean-Philippe Descamps (CEA)

S1 Collision, Agglomeration and Breakup 13:00−14:20, April 3, Room 405

Session Chair: **Yannis Hardalupas (Imperial College London)**

13:00 #293: Analysis of particle impact deformation by material point method

Saba Saifoori (University of Leeds); Saeid Nezamabadi (University of Montpellier); Mojtaba Ghadiri (University of Leeds)

13:20 #670: Impact efficiency of fine particles interacting with a collector under different flow conditions

Martin Sommerfeld (Otto-von-Guericke University Magdeburg); Manuel A. Taborda (Otto-von-Guericke University Magdeburg)

13:40 #801: Collision of ice particles with an ice surface studied by positron emission particle tracking (PEPT)

Yu-Fen Chang (Western Norway University of Applied Sciences); Pavel Struchalin (Western Norway University of Applied Sciences); Boris V Balakin (Western Norway University of Applied Sciences)

14:00 #441: Interaction of a bubble with a vortex-ring in the presence of surfactants

Maria Zednikova (Institute of Chemical Process Fundamentals of the CAS); Tereza Semlerová (Institute of Chemical Process Fundamentals of the CAS); Jaroslav Tihon (Institute of Chemical Process Fundamentals of the CAS); Tereza Travnickova (Institute of Chemical Process Fundamentals of the CAS); Jaromir Havlica (Institute of Chemical Process Fundamentals of the CAS); Sandra Orvalho (Institute of Chemical Process Fundamentals of the CAS)

S1 Cavitation/Nucleation 13:00−14:40, April 3, Room 406

Session Chair: **Hiroyuki Takahira (Osaka Metropolitan University)**

13:00 #136: Effect of liquid density on relation between developing time and size of laser induced bubble

Hitoshi Soyama (Tohoku University); Chieko Kuji (Tohoku University); Hiroyuki Kogawa (Japan Atomic Energy Agency); Masatoshi Futakawa (Japan Atomic Energy Agency)

13:20 #252: Growth and collapse of a bubble near a viscoelastic solid: effects of viscoelasticity

Jihoo Moon (KAIST); Ehsan Mahravan (KAIST); Daegyoum Kim (KAIST)

13:40 #213: Energy barrier of homogeneous bubble nucleation in liquid hydrogen as a quantum fluid and its scaling relation to a classical fluid

Shin-ichi Tsuda (Department of Mechanical Engineering, Kyushu University); Ryuji Takahashi (Kyushu University); Hiroki Nagashima (University of the Ryukyus); Takashi Tokumasu (Tohoku University); Satoshi Watanabe (Kyushu University)

14:00 #310: Investigation of 2-D and 3-D ventilated supercavities using high-speed X-ray systems

Nicholas A Lucido (University of Michigan); Harish Ganesh (University of Michigan); Steve Ceccio (Univ Of Michigan)

14:20 #76: Dynamical threshold of cavitation due to weak tension induced by water flows

Shigeo Fujikawa (Institute of Physical Fluid Dynamics); Toshihide Fujikawa (Institute of Physical Fluid Dynamics); Ryu Egashira (Institute of Physical Fluid Dynamics); Kamel Hooman (Institute of Physical Fluid Dynamics)

S1 OS: Bubbles and Drops (Bubbles) 13:00−14:40, April 3, Room 501

Session Chair: **Chao Sun (Tsinghua University)**

13:00 #728: On the stability of bubble chains in champagne

Roberto Zenit (Brown University); Omer Atasi (IMFT - Toulouse); Mithun Ravisankar (Brown University); Dominique Legendre (IMFT - Toulouse)

13:20 #207: Bubble collapse in hydraulic fluids

Andris Rambaks (RWTH Aachen University, Institute for Fluid Power Drives and Systems (ifas)); Katharina Schmitz (RWTH Aachen University, Institute for Fluid Power Drives and Systems (ifas))

13:40 #47: On the terminal velocity drop of elongated bubbles in highly viscous fluid and small pipe inclination

Alexandre Boucher (UNiversity of Toulouse); **Joël Karp** (University of Toulouse); Roel Belt (TotalEnergies); Alain A Liné (University of Toulouse)

14:00 #179: Cavitation induced by pulsed and continuous-wave fiber lasers in confinement

Jelle Schoppink (University of Twente); Jan Krizek (Swiss Federal Institute of Technology in Lausanne (EPFL)); Christophe Moser (Swiss Federal Institute of Technology in Lausanne (EPFL)); David Fernandez Rivas (University of Twente)

14:20 #161: Coalescence-induced jumping bubbles in microgravity

Mohammed Qaisar RAZA (Birla Institute of Technology and Science Pilani); Moritz Von Kockritz (IMFT); Julien Sebilleau (IMFT); **Catherine N. Colin** (Institut de Mécanique des Fluides de Toulouse); Matevz Zupancic (University of Ljubljana); Mattia Bucci (University of Ljubljana); Tadej Troha (University of Ljubljana); Iztok Golobic (University of Ljubljana)

S1 OS: Boiling, Condensation, Evaporation 13:00−14:20, April 3, Room 502

Session Chair: **Matteo Bucci (MIT)**

13:00 #112: High humidity enhances the evaporation of non-aqueous volatile sprays

Sander Huisman (Universiteit Twente); Morgan (Mogeng) Li (Physics of Fluids Group, University of Twente); Detlef Lohse (Physics of Fluids Group, Max-Planck Center Twente for Complex Fluid Dynamics & JM Burgers Center, Department of Science and Technology, University of Twente)

13:20 #158: Simulation of droplet sizes for flashing sprays with an extended ELSA model

Jan Wilhelm Gärtner (Institute for Combustion Technology); Andreas Kronenburg (Institute for Combustion Technology)

13:40 #244: Dimensional and experimental analysis of flashing flow through simple orifices

Ali Vakil (Coanda Research and Development); Mohammad Shariati (Coanda Research and Development); Konstantin Pougatch (Coanda Research and Development)

14:00 #479: An experimental characterization of the gravity-driven flashing of superheated water in a pool-type geometry

Jimmy Martin (IRSN); Pierre RUYER (IRSN); Matthieu Duponcheel (Université Catholique de Louvain); Yann Bartosiewicz (Université Catholique de Louvain)

S1 Computational Techniques for Multiphase Flows 13:00−14:40, April 3, Room 503

Session Chair: **Takayuki Aoki (Tokyo Institute of Technology)**

13:00 #704: Implementation of the coupled level set and volume of fluid method in OpenFOAM: a comparison with existing VOF techniques

Songtao Chen (Shanghai Jiao Tong UNiversity); Weiwen Zhao (Shanghai Jiao Tong UNiversity); Decheng Wan (Shanghai Jiao Tong UNiversity)

13:20 #530: A hybrid IBM, LES, VoF and Lagrangian tracking for two-phase flows simulation. application to inline separation

Hanane Atmani (IMFT); Dominique Legendre (IMFT); Rémi Zamansky (IMFT); Eric CLIMENT (IMFT)

13:40 #824: CFD study on erosion characteristics of a pipe bend under liquid-solid two phase flow

Gyanendra Tiwari (Indian Institute of Technology Madras); Dhiman Chattarjee (Indian Institute of Technology Madras)

14:00 #547: Prediction of flow pattern transition in pipelines using Taylor-Hood finite elements

David Lazo-Vásquez (Universidade de São Paulo); Jorge Luis Baliño (Universidade de São Paulo)

14:20 #870: Accuracy of state-of-the-art CFD solvers for the numerical simulation of cavitation, particle re-suspension/settling and oil-water separation processes, for oily-sludge treatment applications

Manolia Andredaki (Liverpool John Moores University); Marco Picco (University of Brighton); Stephen Symes (Liverpool John Moores University); Eduardo Blanco Davis (Liverpool John Moores University); Jin Wang (Liverpool John Moores University); Ben Monkton (Envorem); Mike Levey (Envorem); Mark Batt-Raawden (Envorem); **Anastasios Georgoulas** (University of Brighton)

S1 Interfacial Flows 13:00−14:20, April 3, Room 504

Session Chair: **Shunji Homma (Saitama University)**

13:00 #89: Breakup of surfactant liquid jet by a coaxial atomizer

Mathieu Alonzo (University Grenoble Alpes); **Zhujun Huang** (University Grenoble Alpes); Alain Cartellier (University Grenoble Alpes)

13:20 #226: Direct numerical simulation of coaxial atomisation in fiber regime

Jean-Christophe Hoarau (ONERA); Florian Granger (ONERA); Luc-Henry Dorey (ONERA); Davide Zuzio (ONERA); Jean-Luc Estivalezes (ONERA)

13:40 #568: Numerical study on the primary atomization in gas-liquid pintle injector

Tai Jin (Zhejiang University); **Tinglan Tang** (Zhejiang University); Wei Lin (Zhejiang University of Technology); Shuihua Zheng (Zhejiang University of Technology); Kun Luo (Zhejiang University); Jianren Fan (Zhejiang University)

14:00 #430: Accuracy of a diffuse interface model for LES of gas-assisted atomization

Florian Granger (ONERA); Luc-Henry Dorey (ONERA); Jean-Christophe Hoarau (ONERA); Davide Zuzio (ONERA); Jean-Luc Estivalezes (ONERA)

S1 Non-Newtonian Multiphase Flows 13:00−14:40, April 3, Room 505

Session Chair: **Marco Edoardo Rosti (Okinawa Institute of Science and Technology)**

13:00 #417: On viscoelastic bungee jet induced by impact

Kyota Kamamoto (Tokyo University of Agriculture and Technology); Hiroya Watanabe (Tokyo University of Agriculture and Technology); Asuka Hosokawa (Tokyo University of Agriculture and Technology); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

13:20 #546: Numerical simulations of viscoelastic jets using the FENE-P model

Konstantinos Zinelis (Imperial College London); Thomas Abadie (University of Birmingham); Jesse Capecelatro (University of Michigan); Gareth McKinley (Massachusetts Institute of Technology); Omar Matar (Imperial College London)

13:40 #165: Elasto-inertial migration of a neutrally buoyant spheroid in the viscoelastic channel flow

Yansong Li (Tsinghua University); Chunxiao Xu (Tsinghua University); Lihao Zhao (Tsinghua University)

14:00 #246: Experimental study on pressure drop reduction in pipe line flow of C Heavy Oil by adding surfactant aqueous solution

Xiao Ma (National Institute of Maritime, Port and Aviation Technology); Isamu Fujita (National Institute of Maritime, Port and Aviation Technology); Masao Ono (National Institute of Maritime, Port and Aviation Technology)

14:20 #765: An in-situ method for determining rheological properties of non-Newtonian fluids flowing in a circular cylinder by measuring pressure drop

Nobuaki Ikeda (Graduate School of Keio University); Ayuri Kimoto (Graduate School of Keio University); Satoko Fujioka (Keio University); Koichi Terasaka (Keio University)

—— Coffee Break ——

S2 Particle Dynamics 15:00−16:20, April 3, Room 301

Session Chair: **Masahiro Takei (Chiba University)**

15:00 #602: Impact dynamics of a rigid sphere onto water: influence of surface wettability

Prasanna Kumar Billa (IIT MADRAS); Tejaswi Josyula (Institute for Technical Thermodynamics, Technical University of Darmstadt); Pallab Sinha Mahapatra (Indian Institute of Technology, Madras)

15:20 #797: Towards numerical simulation of finite-sized moving particles in compressible flow

Swagat K Nayak (Insitute for Hydromechanics, Karlsruhe Institute of Technology); Markus Uhlmann (Insitute for Hydromechanics, Karlsruhe Institute of Technology)

15:40 #33: Towards modeling of soft deformable micro particles in dilute multiphase flow

Jana Wedel (Friedrich-Alexander Universität Erlangen Nürnberg); Paul Steinmann (Friedrich-Alexander Universität Erlangen Nürnberg, University of Glasgow); Mitja Strakl(University of Maribor); Matjaz Hribersek (University of Maribor); Jure Ravnik (University of Maribor)

16:00 #200: Beyond coffee ring like pattern

Appurva Tiwari (Shiv Nadar Institute of Eminence); Sehyun Shin (Korea University); Seong Jae Lee (The University of Suwon); **Ashish K Thokchom** (Shiv Nadar Institute of Eminence)

S2 OS: Numerical Modeling of Granular and Multiphase Flows 15:00−16:20, April 3, Room 401

Session Chair: **Hiroaki Katsuragi (Osaka University)**

15:00 #356: Bubble dynamics in melt pool of additive manufacturing based on MPS-DEM simulation

Guangtao Duan (The University of Tokyo); Mikio Sakai (The University of Tokyo)

15:20 #703: Numerical investigation on the two-phase flow of hydraulic pipeline with the lateral vibration based on MPS-DEM method

Renxiang Li (Shanghai Jiao Tong University); Fengze Xie (Shanghai Jiao Tong University); Decheng Wan (Shanghai Jiao Tong University)

15:40 #517: Comparison of Eulerian and CFD-DEM simulations of segregation behaviour of liquid-solid slurry flow through a horizontal channel

Prantik Das (Indian Institute of Technology Delhi); Vivek V. Buwa (Indian Institute of Technology Delhi)

16:00 #730: Resolved CFD-DEM simulation of three-phase flows with non-spherical particles

Kimiaki Washino (Osaka University); Ei Chan (Osaka University); Taichi Tsujimoto (Osaka University); Takuya Tsuji (Osaka University); Toshitsugu Tanaka (Osaka University)

S2 Modelling of Multiphase Flows 15:00−16:20, April 3, Room 402

Session Chair: **Gretar Tryggvason (Johns Hopkins University)**

15:00 #172: Comparison of population balance models for polydisperse bubbly flow in a constricted vertical pipe

Victor Habiyaremye (NRG); Hans Kuerten (TU Eindhoven); Edo Frederix (NRG)

15:20 #570: Euler-Euler simulation of air-water flow in a bubble column using method of classes population balance: validation with radioactive particle tracking (RPT)

Manoj Kumar Beriya (Indian Institute of Technology Delhi); Shantanu Roy (Indian Institute of Technology Delhi)

15:40 #486: Assessment of multi-fluid, shallow-water thin film and DPM approaches for the numerical simulation of a bearing chamber

Nikolay K Kirov (Onera); Jean-Mathieu Senoner (Onera); Davide Zuzio (Onera); Mathieu Picard (Onera); Jean-Luc Estivalezes (Onera)

16:00 #173: Numerical modelling of water flashing at sub-atmopsheric pressure

Clément Loiseau (EDF); Stéphane Mimouni (EDF); Dider Colmont (EDF); Stéphane Vincent (Université Gustave Eiffet)

S2 Experimental Methods for Multiphase Flows 15:00−16:20, April 3, Room 403

Session Chair: **Ruud Henkes (Delft University of Technology)**

15:00 #48: Shake-the-Box technique to investigate an elongated air bubble flowing in stagnant liquid , in a slightly inclined pipe

Alexandre Boucher (University of Toulouse); Lucas Pavlov (University of Toulouse); Sébastien Cazin (UNiversity of Toulouse); Roel Belt (TotalEnergies); **Alain A Liné** (University of Toulouse)

15:20 #802: Pressure drop measurements of Taylor bubble in counter-current turbulent flow

Jan Kren (Jožef Stefan Institute); Iztok Tiselj (Jožef Stefan Institute); Blaž Mikuž (Jožef Stefan Institute)

15:40 #545: Experiments on air-water slug flow in a horizontal pipe using high speed imaging

Belma B Hadzovic (NTNU); Eirik Æsøy (NTNU); Paul R. Leinan (SINTEF); James R. Dawson (NTNU)

16:00 #675: Experimental analysis of three-phase gas-liquid-solid intermittent flows in vertical pipelines

Ronaldo L Höhn (Universitat Rovira i Virgili); Sylvana Varela Ballesta (Universitat Rovira i Virgili); Youssef Stiriba (Universitat Rovira i Virgili)

S2 OS: Industrial Applications 15:00−16:20, April 3, Room 404

Session Chair: **Koichi Terasaka (Keio University)**

15:00 #512: Scale-up investigations of a jet loop reactor for the implementation of a chemical process in an alternative reactor concept

Marc Maly (Hamburg University of Technology); Rafael Kuwertz (Ehrfeld Mikrotechnik GmbH); Joachim Heck (Ehrfeld Mikrotechnik GmbH); Michael Schlüter (Hamburg University of Technology)

15:20 #725: Impact driven scalable liquid encapsulation: a new paradigm in encapsulation methods

Sirshendu Misra (University of Waterloo); Kumari Trinavee (University of Waterloo); Naga Siva Gunda (University of Waterloo); **Sushanta Mitra** (University of Waterloo)

15:40 #174: Adsorption rate prediction of activated carbon packed bed using CFD

Yuma Kasai (Shizuoka University); Yoshinori Jinbo (Shizuoka University); Hideya Kamikawa (Toclas Corporation); Toshiyuki Sanada (Shizuoka University)

16:00 #424: Numerical modelling of flow in alkaline water electrolysers

Morgan Kerhouant (Imperial College London); Thomas Abadie (University of Birmingham); Raj Venuturumilli (bp); Andre Nicolle (bp); Omar Matar (Imperial College London)

S2 Collision, Agglomeration and Breakup 15:00−16:20, April 3, Room 405

Session Chair: **Martin Sommerfeld (Otto-von-Guericke-Universität Magdeburg)**

15:00 #399: Influence of viscosity and surface wettability on drop-wall impact

Ghoku Krishnan (University of Virginia); **Kevin Fletcher** (University of Virginia); Trevor Marchhart (University of Virginia); Eric Loth (University of Virginia)

15:20 #543: Obstruction of spreading droplets on a flat surface by non-deformable objects

Marcus Horwich (Imperial College London); **Yannis Hardalupas** (Imperial College London)

15:40 #811: Fragmentation of water droplets dispersed in butter under mechanical agitation

Antoine Violas (Laboratoire de Génie Chimique); Kevin Roger (Laboratoire de Génie Chimique); Paul Duru (Institut de Mécanique des Fluides de Toulouse); Olivier Masbernat (Laboratoire de Génie Chimique)

16:00 #145: Direct-numerical simulation of droplet breakup in homogeneous isotropic turbulence

Palas Kumar Farsoiya (Princeton University); Luc Deike (Princeton University); Rodney O. Fox (Iowa State University)

S2 Cavitation/Nucleation 15:00−16:20, April 3, Room 406

Session Chair: **Shin-ichi Tsuda (Kyushu University)**

15:00 #313: Cavitation inception and its noise emissions during the interaction of a pair of line vortices

Daniel Knister (University of Michigan); Harish Ganesh (University of Michigan); Steve Ceccio (Univ Of Michigan)

15:20 #393: Simultaneous high-speed observation in two-directions and measurement of impulsive pressure distribution for bubble collapse near a wall

Kazuma Matsumoto (Osaka Metropolitan University); Hayato Kida (Osaka Metropolitan University); Toshiyuki Ogasawara (Osaka Metropolitan University); Hiroyuki Takahira (Osaka Metropolitan University)

15:40 #598: Evaluation of thermal effects in cavitating flow by heating of nozzle wall

Junnosuke Okajima (Tohoku University); Kota Sato (Tohoku University)

16:00 #789: Influence of longitudinal grooves on Venturi cavitating flows

Xu Meng (Tsinghua University); Zhigang Zuo (Tsinghua University); Shuhong Liu (Tsinghua University)

S2 OS: Bubbles and Drops (Bubbles) 15:00−16:20, April 3, Room 501

Session Chair: **Roberto Zenit (Brown University)**

15:00 #690: Visualization and measurement of foam flowing between two-dimensional narrow parallel plates

Shimpei Saito (AIST); Soumei Baba (AIST); Naoki Takada (National Institute of Advanced Industrial Science and Technology); Satoshi Someya (AIST); Hiroshi Ito (AIST)

15:20 #239: A simulation of foam formation using multi-phase-field model and lattice Boltzmann method with adaptive mesh refinement

Yos P Sitompul (Tokyo Tech); Takayuki Aoki (Tokyo Tech); Seiya Watanabe (Kyushu University); Kenta Sugihara (JAEA); Tomohiro Takaki (Kyoto Institute of Technology)

15:40 #567: Influence of particle surface properties on the stability of pickering foams

Nick Brown (University of Oklahoma); **Sepideh Razavi** (University of Oklahoma)

16:00 #452: Lagrangian modeling of vapor bubble growth in flash boiling single droplet considering bubble-bubble interactions

Avijit Saha (Institute for Combustion Technology); Abhishek Deshmukh (Institute for Combustion Technology); Temistocle Grenga (Institute for Combustion Technology); Heinz Pitsch (Institute for Combustion Technology)

S2 OS: Boiling, Condensation, Evaporation 15:00−16:20, April 3, Room 502

Session Chair: **Matteo Bucci (MIT)**

15:00 #736: Experimental investigation of inverted annular film boiling characteristics near the atmospheric pressure

Kyung Mo Kim (University of Michigan); Adam Burak (University of Michigan); Joseph Kelly (The U.S. Nuclear Regulatory Commission); Stephen Bajorek (The U.S. Nuclear Regulatory Commission); **Xiaodong Sun** (University of Michigan)

15:20 #810: Effects of the ITO glass on the critical heat flux and boiling phenomena in a downward-faced flow boiling

Zhenhan Hong (The University of Tokyo); Shuichiro Miwa (The University of Tokyo); Kai Wang (The University of Tokyo); Taishan Chen (The University of Tokyo); **Koji Okamoto** (The University of Tokyo)

15:40 #747: Heat transfer and flow characteristics of falling film evaporation with nucleate boiling on an inclined plate

Tsutomu Ubara (Kobe University); **Keisuke Hirai** (Kobe University); Katsumi Sugimoto (Kobe University); Hitoshi Asano (Kobe University)

16:00 #511: Dynamics of forced flow boiling ebullition cycles at natural and artificial cavities

Dapeng Yang (Imperial college london); Antonis Sergis (Imperial college london); Yannis Hardalupas (Imperial college london)

S2 Computational Techniques for Multiphase Flows 15:00−16:20, April 3, Room 503

Session Chair: **Spencer Bryngelson (Georgia Institute of Technology)**

15:00 #628: Lagrangian-Eulerian modeling of fuel-coolant interaction in nuclear reactor severe accidents

Min-Soo Kim (Korea Maritime and Ocean University), Dong-Jin Shin (Korea Maritime and Ocean University), Dong-Ha Kim (Korea Maritime and Ocean University), **Kwang-Hyun Bang** (Korea Maritime and Ocean University)

15:20 #114: Numerical simulation of counter-current flow in a vertical pipe with rounded ends

Michio Murase (Institute of Nuclear Safety System, Inc.); Toshiya Takaki (Institute of Nuclear Safety System, Inc.); Yoichi Utanohara (Institute of Nuclear Safety System, Inc.)

15:40 #493: Spreading of spilled low sulfur fuel oil (LSFO): a numerical study

Jaebeen Lee (Seoul National Univ); Linfeng Piao (Seoul National Univ); Hyungmin Park (Seoul National Univ)

16:00 #286: A 3D wide-area simulation for real river flood disaster including driftwood with high resolution mesh

Dawei Shen (Tokyo Institude of Technology); Takayuki Aoki (Tokyo Institude of Technology); Seiya Watanabe (Kyushu University); Shuji Moriguchi (Tohoku University); Shinsuke Takase (Hachinohe Institute of Technology); Masaaki Sakuraba (Nippon Koei)

S2 Interfacial Flows 15:00 – 16:20, April 3, Room 504

Session Chair: **Jean-Christophe Hoarau (ONERA)**

15:00 #44: Using branched ionic surfactants for enhanced spreading of aqueous formulations

Nina M Kovalchuk (University of Birmingham); Masanobu Sagisaka (Hirosaki University); Hinata Komiyama (Hirosaki University); Nikhil Patani (University of Birmingham); James Haines (University of Birmingham); Mark Simmons (University of Birmingham)

15:20 #232: Ribbing patterns in rotating Landau-Levich drag-out problem.

Rosie Cates (ENS Lyon); **Pierre Trontin** (Univ. Lyon / LMFA); J. John Soundar Jerome (Univ. Lyon / LMFA); Jean-Philippe Matas (Univ. Lyon / LMFA)

15:40 #374: An AI super-resolution method for subfilter modeling of interfacial flows

Mathis Bode (Forschungszentrum Juelich GmbH)

16:00 #116: A depth–integral model for weakly–compressible falling films

Paolo Botticini (Università degli studi di Brescia); **Gianluca Lavalle** (Mines Saint–Étienne); Davide Picchi (Università degli Studi di Brescia); Pietro Poesio (Università di Brescia)

S2 Non-Newtonian Multiphase Flows 15:00 – 16:20, April 3, Room 505

Session Chair: **Koji Hasegawa (Kogakuin University)**

15:00 #245: CFD analysis of a Taylor drop rising in co-current flow of non-Newtonian liquids

Revathi Sri E (IIT Madras); S Vengadesan (IIT Madras)

15:20 #101: Thixotropic effects in oscillating droplets

Matthias Ibach (Institute of Aerospace Thermodynamics (ITLR), University of Stuttgart); Jonas Steigerwald (Institute of Aerospace Thermodynamics (ITLR), University of Stuttgart); Bernhard Weigand (Institute of Aerospace Thermodynamics (ITLR), University of Stuttgart)

15:40 #181: A conservative level set method for a rising gas bubble in a viscoelastic fluid

William Doherty (Cardiff University); Timothy Phillips (Cardiff University); Zhihua Xie (Cardiff University)

16:00 #199: Numerical analysis of planar hydraulic jump in non-Newtonian thin film flow

Banashree Samanta (IIT Kharagpur); Gargi Das (IIT Kharagpur); Subhabrata Ray (IIT Kharagpur); Manish Kaushal (IIT KHARAGPUR)

Poster Session with Beer 16:20−17:40 Reception Hall

P1 #305: Measurement of Ultrafine Bubbles with Impurities Using Sonoluminescence Behavior

Kaito Morishita (National Institute of Technology, Kochi College); Yusuke Nishiuchi (National Institute of Technology, Kochi College); Hayato Okumura (National Institute of Technology, Kochi College); Shigenori Akamatsu (National Institute of Technology, Kochi College); Takashi Hata (National Institute of Technology, Kochi College)

P2 #327: Ultrafine bubble loss in water passing through a long plastic tube

Kurumi Nakajima (Keio University); Hanako Sasaki (Keio University); Koichi Terasaka (Keio University); Satoko Fujioka (Keio University); Shun Harada (Graduate School of Keio University); Adam Donaldson (Dalhousie University)

P3 #715: Study on O/W Emulsion with Ultrafine Bubbles

Mizuki Kumon (National Institute of Technology, Kochi College); Yusuke Nishiuchi (National Institute of Technology, Kochi College); Takashi Hata (National Institute of Technology, Kochi College); Kaori Tada (National Institute of Technology, Kochi College)

P4 #396: Numerical Simulations of Two Phase Flows inside a Pore Network: a Window to Pore-scale Oil Recovery Process

Ankit Chourasia (Indian Institute of Technology, Kharagpur); Sushanta Mitra (University of Waterloo); Anandaroop Bhattacharya (Indian Institute of Technology, Kharagpur)

P5 #301: Experimental Study on the Evolution of Turbulent Structures in a Near Field Bubbly Jet with Low Void Fraction

Hyunduk Seo (Pusan National University); Kyung Chun Kim (Pusan National University)

P7 #342: Evaluation of burn area based on CEM43 using temperature distribution around medical pulsed laser induced bubble

Yasuhiro Sugimoto (Kanazawa Institute of Technology); Ikkei Araga (Kanazawa Institute of Technology); Takashi Fukue (Kanazawa Institute of Technology)

P8 #401: Laser-induced bubble collapse behavior near adjacent rigid and soft walls

Ritsuki Kamei (Kanazawa Institute of Technology); Yasuhiro Sugimoto (Kanazawa Institute of Technology)

P9 #815: Observation of cavitation on axisymmetric body with hemispherical nose

Rahul Ravindran (INDIAN INSTITUTE OF TECHNOLOGY); Dhiman Chatterjee (Indian Institute of Technology, Madras); Shamit Bakshi (Indian Institute of Technology, Madras)

P10 #228: A Fokker-Planck-Boltzmann kinetic model of nucleation in cavitating and boiling flows

Kasper Petersen (University of British Columbia); Joshua R Brinkerhoff (University of British Columbia)

P13 #699: Hydrodynamics of liquid-liquid slug flow in circular channels: The effects of fluid properties and channel geometries

Satoko Fujioka (Keio University); Arisa Hirata (Keio University); Tomoya Tetsuka (Keio University); Koichi Terasaka (Keio University)

P14 #534: Turbulent two-phase liquid-liquid flow inside a centrifugal pump impeller

William Denner Pires Fonseca (UNICAMP); Rafael Franklin Lazaro Cerqueira (UNICAMP); Rodolfo M. Perissinotto (University of Campinas); William Monte Verde (Center for Petroleum Studies); Marcelo Souza Castro (UNICAMP); Antonio Carlos Bannwart (UNICAMP); Erick Franklin (UNICAMP)

P15 #90: The Drag Force on an Oscillatory Spherical Bubble in Power-law Shear-thinning Fluid

Xianping Zhang (Osaka University); Kazuyasu Sugiyama (Osaka University); Tomoaki Watamura (Kyoto Institute of Technology)

P16 #576: Phase diagram of bungee-type behavior of impulsively-induced viscoelastic liquid jets

Asuka Hosokawa (Tokyo University of Agriculture and Technology); Hiroya Watanabe (Tokyo University of Agriculture and Technology); Kyota Kamamoto (Tokyo University of Agriculture and Technology); Hiroaki Kusuno (Tokyo University of Agriculture and Technology); Kazuya U. Kobayashi (Nippon Institute of Technology); Toshiyuki Tagawa (Tokyo University of Agriculture and Technology)

P17 #820: Motion of droplet containing polymer on high temperature surface

Hayato Masuda (Osaka Metropolitan University); Shinichiro Okumura (Osaka Metropolitan University); Koki Wada (Osaka Metropolitan University); Hiroyuki Iyota (Osaka Metropolitan University)

P18 #846: Numerical Simulation of shear-induced drop deformation and breakup in viscoelastic fluids

Shunsuke Nakashima (Tokushima University); Mitsuhiro Ohta (Tokushima University); Mark Sussman (Florida State University)

P19 #300: Experimental Study of Two-phase Turbulent Wake Using PIV Technique

Wei-Cheng Chen (National Cheng Kung University); **Keh-Chin Chang** (National Cheng Kung University)

P20 #564: Numerical analysis of aerosol capturing behavior in face masks obtained by X-ray CT

Kodai Hada (Hiroshima University); Shirzadi Mohammadreza (Hiroshima University); Tomonori Fukasawa (Hiroshima University); Kunihiro Fukui (Hiroshima University); Toru Ishigami (Hiroshima University)

P21 #601: Effect of particle size on inertial particle focusing in square duct flows

Hiroshi Yamashita (Hiroshima University); Takeshi Akinaga (Akita University); Masako Sugihara-Seki (Kansai University)

P22 #835: The development of fully controlled homogeneous and isotropic turbulence water tank for particle-laden flow research

Henghui Zhou (Guangdong Technion-Israel Institute of Technology); Baiyu Lu (Guangdong Technion-Israel Institute of Technology); Hongtao Qian (Guangdong Technion-Israel Institute of Technology); Biaosheng Luo (Guangdong Technion-Israel Institute of Technology); Cheng Li (Guangdong Technion- Israel Institute of Technology)

P23 #475: Slipping and friction of a sphere rolling up a granular slope

Takeshi Fukumoto (Osaka University); Ken Yamamoto (Osaka University); Makoto Katsura (Osaka University); Hiroaki Katsuragi (Osaka University)

P24 #584: The effect of asymmetry and pressure balance in granular capillary phenomena

Yuki Yamamoto (Osaka University); Ken Yamamoto (Osaka University); Makoto Katsura (Osaka University); Hiroaki Katsuragi (Osaka University)

P25 #633: Effect of liquid bridge forces on the dynamic flow of particles

Yuma Hirose (National Institute of Technology, Oita College); Shunta Tsukuma (National Institute of Technology, Oita College); Koichiro Ogata (National Institute of technology, Oita College); Kimiaki Washino (Osaka University)

P26 #634: Relation between bidispersivity and ordered structure in a compressed two-dimensional magnet-particle system

Kazuki Tsuchikusa (Osaka University); Ken Yamamoto (Osaka University); Makoto Katsura (Osaka University); Hiroaki Katsuragi (Osaka University)

P27 #307: Effect of ultrasound on the viscosity of cementitious materials

Jihwan Seo (Seoul National University); **Ho-Young Kim** (Seoul National University); Wonjung Kim (Sogang University)

P28 #758: Formation of Acoustic Streaming in Standing Wave Sound Field by Ultrasonic Vibration

Kenji Kofu (Nihon University); Kazuki Koinuma (Nihon University); Hirofumi Nonaka (Nihon University)

P29 #627: Effect of powder head on horizontal conveying of fluidized powder

Kiyoshiro Inami (National Institute of Technology, Oita College); Koichiro Ogata (National Institute of technology, Oita College)

P31 #780: Wave propagation induced by a vortex for fibers clamped on the wall

Shota Akita (Osaka University); Takehiro Fujii (Osaka University); Kie Okabayashi (Osaka University); Shintaro Takeuchi (Osaka University)

P32 #283: Experimental investigation of the effect of stages number on Electrical Submersible Pumps performance operating with two-phase gas-liquid flow

Júlio Orssatto (UNICAMP); **William Monte Verde** (Center for Petroleum Studies); Yan Capellaro (UNICAMP); Rafael Cerqueira (UNICAMP); Jorge Biazussi (UNICAMP); Valdir Estevam (Center for Petroleum Studies); Marcelo S Castro (UNICAMP); Bernardo Foresti (PETROBRAS); Antonio Bannwart (Center for Petroleum Studies)

P33 #784: Wetting Characterization of the Liquid Poured onto the Square Rod Array

Masayuki Kaneda (Osaka Metropolitan University); Zelin Li (Osaka Metropolitan University); Makoto Sugimoto (Tohoku University); Tatsuya Miyazaki (Osaka Metropolitan University); Keita Akune (Osaka Metropolitan University); Kazuhiko Suga (Osaka Metropolitan University)

P34 #839: Experimental study and prediction of the flow reversal in inclined pipes

Lisong Wang (Institute of Mechanics, Chinese Academy of Sciences); Shuo Liu (Institute of mechanics, Chinese Academy of Sciences); Lintong Hou (Institute of Mechanics, Chinese Academy of Sciences); Meng Yang (Institute of Mechanics, Chinese Academy of Sciences (CAS)); Yanhuan Zhang (Insititute of Mechanics,Chinese Academy of Sciences,Beijing); Jingyu Xu (Institute of Mechanics, Chinese Academy of Sciences)

P36 #473: Development of a stress field visualization method for dynamic fluids on channel walls.

Shoto Sekiguchi (Tokyo University of Agriculture and Technology); Kazuya U. Kobayashi (Nippon Institute of Technology); Kei Morikawa (St. Marianna University School of Medicine); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

P37 #62: Improvements on a direct-ALE scheme for multiphase flows with thermodynamic consistency

Thibaud Vazquez-Gonzalez (CEA)

P38 #222: Enhanced mass transfer performance of aerated stirred tank reactors by modification of the standard Rushton turbine

Ingrid Caroline Haase (Hamburg University of Technology); Jürgen Fitschen (Hamburg University of Technology); Maike Kuschel (Boehringer Ingelheim Pharma GmbH & Co. KG); Thomas Wucherpfennig (Boehringer Ingelheim Pharma GmbH & Co. KG); Michael Schlüter (Hamburg University of Technology)

P39 #467: Effect of external electric field on freezing initiation of supercooled water due to characteristics of vertical pipe inner surface

Wataru Matsumoto (Kanazawa Institute of Technology); Masanori Fujimoto (Kanazawa Institute of Technology)

P40 #505: A Cartesian Cut Cell Method for Phase-Change Problems : Study of the Rayleigh-Bénard Instability with Melting Boundary

Tomas Fullana (Sorbonne University); A. Quiros Rodriguez (Sorbonne University); V. Le Chenadec (Gustave Eiffel University); T. Sayadi (Sorbonne University)

P41 #558: Study of behavior of multiple dispersed phases in a continuous phase under an electric field

Daiki Inaba (Kanazawa Institute of Technology); Masanori Fujimoto (Kanazawa Institute of Technology)

P42 #177: Nucleation Patterning on Reduced Graphene Oxide-coated Micropillar surface for Enhanced Boiling Heat Transfer

Maroosol Yun (Yonsei University); Geehong Choi (Yonsei University); Dong Il Shim (Yonsei University); Donghwi Lee (Jeonbuk Nat'l University); Beom Seok Kim (Seoul Nat'l University of Science and Technology); Hyung Hee Cho (Yonsei University)

P43 #684: Machine learning model to the prediction of heat transfer coefficient of refrigerants inside a multiport mini-channel tube

Nurlaily Agustiarini (Chonnam National University); Hieu Ngoc Hoang (Chonnam National University); Jong-kyu Kim (Chonnam National University); Jong-taek Oh (Chonnam National University)

P44 #617: Deformation and rivulet formation of the sessile droplet falling on a vertical plate

Souma Ando (Chubu University); Hiroya Hiramatsu (Chubu University); Takahiro Ito (Chubu University); Yoshiyuki Tsuji (Nagoya University)

P45 #691: CFD simulations of particle-laden droplets impact on a plane wall

Richard Tribess (Otto-von-Guericke-University Magdeburg); Martin Sommerfeld (Otto-von-Guericke University Magdeburg)

P47 #798: Well-posedness and Stability of Two-Fluid Model Equations for High Speed Bubbly Flow

Takahiro Ayukai (University of Tsukuba); Tetsuya Kanagawa (University of Tsukuba)

P49 #402: Polydisperse particle separation statistics and clustering in Reflux Classifier

Abhishek Sharma (IIT KHARAGPUR); Raja L (IITKGP); Arnab Atta (Indian Institute of Technology Kharagpur)

P50 #509: Building a multiphase CFD framework for bubbly flow interfacial area modeling

Corentin Reiss (CEA); Antoine Gerschenfeld (CEA); Catherine N. Colin (Institut de Mécanique des Fluides de Toulouse)

P51 #651: POD-ANOVA-based Characterization of Powder Mixing Mechanism in a Tote Blender

Qi Shi (The University of Tokyo); Shuo Li (The University of Tokyo); Mikio Sakai (UTokyo)

P52 #39: Improvement of Simple CLSVOF Method in the Full Eulerian Framework

Naoki Shimada (Sumitomo Chemical Co. Ltd.); Yusuke Uchihashi (Sumitomo Chemical Co. Ltd.); **Yuta Yaegashi** (Sumitomo Chemical Co. Ltd.); Miya Matsuo (Sumitomo Chemical Co. Ltd.); Mitsuhiro Ohta (Graduate School of Technology, Industrial and Social Sciences, Tokushima University); Akio Tomiyama (Graduate School of Engineering, Kobe University)

P53 #94: Eulerian Computation of Droplet Preferential Concentration in Turbulence

George Downing (Imperial College London); Yannis Hardalupas (Imperial College London)

P54 #796: Curvature filtering for a high-order and sharp interface multiphase flow solver

Ward G Haegeman (CMAP); david henneaux (VKI); pierre schrooyen (Cenaero); Thierry Magin (VKI); **Marc Massot** (CMAP, Ecole Polytechnique)

P55 #863: Numerical simulation of the impact of gas jet on a free water surface

Ward G Haegeman (CMAP); Clement LeTouze (ONERA); Joel Dupays (ONERA); Marc Massot (CMAP, Ecole Polytechnique)

P56 #874: Development of a correlation for the terminal rising velocity for 2D-bubbles in unconfined domain

Timo A. Merbach (Hamburg University of Technology), Benas Mockus (University of Edinburgh), Kazuma Minamitani (Kobe University), Felix Kexel(Hamburg University of Technology) , Michael Schluter (Hamburg University of Technology), Prashant Valluri (University of Edinburgh), Kosuke Hayashi (Kobe University), Akio Tomiyama (Kobe University)

P57 #397: Simulation of droplet-laden turbulent channel flow by a kinetic approach

Jun Lai (Southern University of Science and Technology); Xiusong Chen (Southern University of Science and Technology); Chunhua Zhang (Southern University of Science and Technology); Lian-Ping Wang (Southern University of Science and Technology); Zuoli Xiao (Peking University)

P58 #580: DUGKS-IBM simulation of particle-laden turbulent channel flow on a non-uniform orthogonal mesh

Kairzhan Karzhaubayev (Southern University of Science and Technology); Lian-Ping Wang (Southern University of Science and Technology); Cheng Peng (Shandong University)

P59 #799: Investigating the Mechanisms of Hydrate Deposition and Agglomeration in Multiphase Flow Conditions

Daniela Marques (NUEM - UTFPR); Carlos Bassani (NUEM - UTFPR); Celina Kakitani Ofuchi (NUEM - UTFPR); **Moises Marcelino Neto** (NUEM - UTFPR); Amadeu K Sum (Colorado School of Mines); Rigoberto E. M. Morales (NUEM - UTFPR)

P60 #880: Terminal Velocity and Mass Transfer of 2D Bubbles in a Confined Hele-Shaw Cell

Benas Mockus (University of Edinburgh); Timo A. Merbach (Hamburg University of Technology); Prashant Valluri (University of Edinburgh); Michael Schlüter (Hamburg University of Technology); Ryo Kurimoto (Kobe University); Kosuke Hayashi (Kobe University); Akio Tomiyama (Kobe University)

Tuesday, April 4, 2023

(Plenary Lecture) **Melany L. Hunt (California Institute of Technology)** Experiments and Modeling of Liquid-Solid Flows with Inertia, 9:00−9:50, Main Hall, Chairperson: Catherine Colin (Institut de Mécanique des Fluides de Toulouse)

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(Keynote Lecture) **Dieter Bothe (Technical University of Darmstadt)** Mass Transfer across Actual Fluid Interfaces – Modeling and Simulation, 10:00−10:40, Main Hall, Chairperson: Katsumi Tsuchiya (Doshisha University)

(Keynote Lecture) **Arezoo Ardekani (Purdue University)** Rheology of Concentrated Suspension of Particles, 10:00−10:40, Room 301, Chairperson: Shigeo Hosokawa (Kansai University)

—— Coffee Break ——

S3 Particle-Laden Flows 11:00−12:20, April 4, Room 301

Session Chair: **Yoichi Mito (Kitami Institute of Technology)**

11:00 #612: Experimental and numerical study of elongated non-spherical particles in near-wall regions

Manuel A Taborda (Otto von Guericke University Magdeburg); Victor Chéron (Otto-von-Guericke Universität); Berend van Wachem (University of Magdeburg); Martin Sommerfeld (Otto-von-Guericke University Magdeburg)

11:20 #622: Interaction between solid particles and coherent structures in turbulent channel flow

Yutaro Motoori (Osaka University); Susumu Goto (Osaka University)

11:40 #42: Particle laden flow around an obstacle: wake instability and forces

Eric Climent (IMFT); Dominik Schuster (IMFT); Ulrich Rude (Friedrich-Alexander Universität Erlangen Nürnberg)

12:00 #637: The vortex merger in dusty flow

Shuai Shuai (Arizona State University); Houssem Kasbaoui (Arizona State University)

S3 OS: Numerical Modeling of Granular and Multiphase Flows 11:00−12:20, April 4, Room 401

Session Chair: **Toru Ishigami (Hiroshima University)**

11:00 #162: Modelling the internal and external flow conditions of an air-core-liquid-ring (ACLR) atomizer using a coupled Eulerian-Lagrangian approach

Miguel Ballesteros (Institute of Process Engineering in Life Sciences, Food Process Engineering, Karlsruhe Institute of Technology); Deisy Becerra (Institute of Process Engineering in Life Sciences, Food Process Engineering, Karlsruhe Institute of Technology); Volker Gaukel (Institute of Process Engineering in Life Sciences, Food Process Engineering, Karlsruhe Institute of Technology)

11:20 #506: Cancelled

11:40 #508: RANS-DEM simulation of particle-laden flow across a backward-facing step

Atul Jaiswal (Technical University of Munich (TUM)); Minh Duc Bui (Technical University of Munich (TUM)); Peter Rutschmann (Technical University of Munich (TUM))

12:00 #510: CFD simulation of scouring from a submerged wall jet with a N-Euler approach

Gaétan Pierre (EDF); William Benguigui (EDF); Jérôme Laviéville (EDF); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT))

S3 Modelling of Multiphase Flows 11:00−12:20, April 4, Room 402

Session Chair: **Matthias Meinke (RWTH Aachen University)**

11:00 #466: Experimental and computational modeling of solid-liquid mixing in an oscillatory baffled reactor containing multi-orifice baffle geometry

Partha Pratim Mondal (Indian Institute of Technology, Delhi); Rohan Jain (Helmholtz-Zentrum Dresden-Rossendrof, Helmholtz Institute Freiberg for Resource Technology); Shaikh Z. Ahammad (Indian Institute of Technology, Delhi)

11:20 #319: Gas liquid flow in hilly terrain pipelines – single and multiple sections

Yehuda Taitel (Tel Aviv University); Dvora Barnea (Tel Aviv University)

11:40 #647: Numerical Simulation of Two-phase CO2 Ejector Flows Using the Implicit Density-based SU2 Solver and Comparative Analysis of HEM and HRM Models

Antoine Metsue (UCLouvain); Sebastien Poncet (Université de Sherbrooke); Yann Bartosiewicz (Université Catholique de Louvain)

12:00 #748: Direct numerical simulation of boiling in microgravity conditions

Loric Torres (IMFT); Catherine Colin (IMFT); **Sébastien Tanguy** (IMFT); Annafederica Urbano (ISAE-SUPAERO)

S3 Experimental Methods for Multiphase Flows 11:00–12:20, April 4, Room 403

Session Chair: **Ruud Henkes (Delft University of Technology)**

11:00 #255: Visualization of two-phase flow in particulate bed by refractive index matching method using CYTOP

Shota Ueda (CRIEPI); Takahiro Arai (CRIEPI); Masahiro Furuya (CRIEPI); Riichiro Okawa (CRIEPI)

11:20 #362: Visualization of continuously rising bubbles in gallium alloy

Sana Maeda (Kobe University); Yudai Kubo (Kobe University); Hideki Murakawa (Kobe University); Katsumi Sugimoto (Kobe University)

11:40 #371: Synchrotron X-ray phase contrast imaging of ultrasonic cavitation phenomena

Luc Biasiori-Poulanges (ETH Zurich); Claire Bourquard (Silicon Austria Labs GmbH); Bratislav Lukic (European Synchrotron Radiation Facility); Ludovic Broche (European Synchrotron Radiation Facility); **Outi Supponen** (ETH Zurich)

12:00 #409: Measurment of the anisotropic drainage in liquid foam using neutron radiography

Artem Skrypnik (Technische Universität Dresden); Pavel Trtik (Paul Scherrer Institute); Katie Cole (Imperial College London); Tobias Lappan (Helmholtz-Zentrum Dresden-Rossendorf); Pablo R. Brito-Parada (Imperial College London); Stephen J. Neethling (Imperial College London); Kerstin Eckert (Technische Universität Dresden, Helmholtz-Zentrum Dresden-Rossendorf); **Sascha Heitkam** (Technische Universität Dresden)

S3 OS: Industrial Applications 11:00–12:20, April 4, Room 404

Session Chair: **Xiaodong Sun (University of Michigan)**

11:00 #551: Experimental study of plugging in a cohesive slurry of ice

Boris V Balakin (Western Norway University of Applied Sciences); Pavel Struchalin (Western Norway University of Applied Sciences)

11:20 #611: Detection of solid-liquid phase changes of LiCl-KCl binary mixture by electrical impedance spectroscopy with platinum-wire electrode (pw-EIS)

So Segawa (Chiba university); Yosephus A K Prayitno (Chiba University); Prima Sejati (Chiba university); Miku Arisato (Kyushu university); Noritaka Saito (Kyushu University); Masahiro Takei (Chiba University)

11:40 #738: Visualization of spatio-temporal void fraction of vertical gas-liquid two-phase flow by coupled multiple current-voltage with wire-mesh sensor and convolutional neural network (MCV-WMS-CNN)

Yosephus A K Prayitno (Chiba University); Daisuke Saito (Chiba University); Shuichiro Miwa (The University of Tokyo); Masahiro TAKEI (Chiba University)

12:00 #740: Flow visualisation and flow patterns in a flat-plate polypropylene pulsating heat pipe

Ali Alqahtani (University of Liverpool); **Volfango Bertola** (University of Liverpool)

S3 Collision, Agglomeration and Breakup 11:00−12:20, April 4, Room 405

Session Chair: **Tomio Okawa (University of Electro-Communications)**

11:00 #623: Mass log-stable distribution of fragments in liquid-liquid fragmentation with solidification

Nicolas D. Rimbert (Université de Lorraine); Miloud Hadj Achour (LEMTA Université de Lorraine); Gagan Kewalramani (LEMTA Université de Lorraine); Bowen Ji (LEMTA Université de Lorraine); Alexandre Labergue (LEMTA Université de Lorraine); Michel Gradeck (LEMTA Univeristé de lorraine); Renaud Meignen (IRSN)

11:20 #794: Large eddy simulations of primary breakup in metal melt gas atomization

Dennis P.L. Thuy (Eindhoven University of Technology); Joris Remmers (Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology); Giulia Finotello (Eindhoven University of Technology)

11:40 #843: Multivariate population balance modeling of inclusion behavior in liquid metal processes

Ashok Das (Institut Jean Lamour, Université de Lorraine); Jean-Sebastien Kroll-Rabotin (Institut Jean Lamour, Université de Lorraine); Thibault Quatravaux (Institut Jean Lamour, Université de Lorraine); JP Bellot (Institut Jean Lamour, Université de Lorraine)

12:00 #332: Influence of the oxygen concentration on the breakup of liquid metal droplets

Leopold J Winter (Technical University of Munich); Thomas Hopfes (Technical University of Munich); Marcus Giglmaier (Technical University of Munich); Nikolaus Adams (Technical University of Munich)

S3 Cavitation/Nucleation 11:00−12:20, April 4, Room 406

Session Chair: **Tim Colonius (California Institute of Technology)**

11:00 #600: Study on damage evaluation using cavitation-bubble collapsing time

Hiroyuki Kawashima (Ibaraki University); Hiroyuki Kogawa (Japan Atomic Energy Agency); Masatoshi Futakawa (Japan Atomic Energy Agency); Nobuatsu Tanaka (Ibaraki University); Chieko Kuji (Tohoku University); Hitoshi Soyama (Tohoku University)

11:20 #609: Transition of cavitation regime on heated NACA0015 hydrofoil

Ning Yang (Tohoku University); Junnosuke Okajima (Tohoku University); Yuka Iga (Tohoku University)

11:40 #166: Influence of tissue stiffness on cavitation cloud formation by high intensity focused ultrasound in agarose gels

Koshi Kishimoto (Osaka Metropolitan University); Toshiyuki Ogasawara (Osaka Metropolitan University); **Hiroyuki Takahira** (Osaka Metropolitan University)

12:00 #645: Dependence of thin film thickness and bubble shape on the gap width between two flat plate: an experimental and numerical study

Sachin Kumar (Indian Institute of Technology Hyderabad); Aleesha Kalam (Indian Institute of Technology Hyderabad); Harish N Dixit (IIT Hyderabad); **Badarinath Karri** (Indian Institute of Technology Hyderabad)

S3 OS: Bubbles and Drops (Bubbles) 11:00–12:20, April 4, Room 501

Session Chair: **Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)**

11:00 #434: Influence of density and viscosity on deformation, breakage and coalescence of bubbles in turbulence

Alessio Roccon (University of Udine); Francesca Mangani (TU Wien); Giovanni Soligo (Okinawa Institute of Science and Technology Graduate University); Alfredo Soldati (TU Wien)

11:20 #701: Effects of impurities on the bursting dynamics of centimetric bubbles

Hongtao Qian (Guangdong Technion- Israel Institute of Technology); Zhengyu Yang (University of Illinois at Urbana-Champaign); Feng Jie (University of Illinois at Urbana-Champaign); Cheng Li (Guangdong Technion- Israel Institute of Technology)

11:40 #235: Numerical simulation of surfactant-laden flows

Giovanni Soligo (Okinawa Institute of Science and Technology Graduate University); Ianto Cannon (Okinawa Institute of Science and Technology); Marco Edoardo Rosti (Okinawa Institute of Science and Technology)

12:00 #648: Role of surfactant's adsorption kinetics on the inhibition of coalescence of bubbles

Sandra Orvalho (Institute of Chemical Process Fundamentals of the CAS); Petr Stanovsky (ICPF of the CAS); Marek Ruzicka (ICPF of the CAS); Maria Zednikova (Institute of Chemical Process Fundamentals of the CAS); Pavlína Basařová (UCT Prague)

S3 OS: Boiling, Condensation, Evaporation 11:00–12:20, April 4, Room 502

Session Chair: **Pierre Ruyer (Institut de Radioprotection et de Sûreté Nucléaire)**

11:00 #343: On the onset of transcritical phase transition: an analytical approach using a non-equilibrium evaporation model

Christoph Steinhausen (Institute of Aerospace Thermodynamics); Anton Schaumäker (Institute of Aerospace Thermodynamics); Bernhard Weigand (Institute of Aerospace Thermodynamics); Grazia Lamanna (Institute of Aerospace Thermodynamics); Andreas Preusche (Reactive Flows and Diagnostics); Andreas Dreizler (Reactive Flows and Diagnostics)

11:20 #370: Capillary fluctuating hydrodynamics description of the boiling phenomenon

Mirko Gallo (University of Brighton); Francesco Magaletti (University of Brighton); Anastasios Georgoulas (University of Brighton); Marco Marengo (University of Brighton); Joel De Coninck (University of Brighton); Carlo Massimo Casciola (Sapienza University of Rome)

11:40 #487: Flow boiling in a vertically oriented miniaturised square channel: from visual observations to laser-based measurements

Zengchao Chen (Imperial College London); **Suryanarayan Lakshminarayan** (Imperial College London); Aleksei Lobasov (Imperial College London); Konstantin S. Pervunin (Imperial College London); Christos Markides (Imperial College London)

12:00 #572: Observations of heterogeneous nucleation phenomena in saturated liquid nitrogen

Florian Chavagnat (Massachusetts Institute of Technology); Bren Phillips (Massachusetts Institute of Technology); Jason Hartwig (NASA); Matteo Bucci (Massachusetts Institute of Technology); Emilio Baglietto (Massachusetts Institute of Technology)

S3 Computational Techniques for Multiphase Flows 11:00−12:20, April 4, Room 503

Session Chair: **Anastasios Georgoulas (University of Brighton)**

11:00 #46: Numerical simulation of viscoelastic and Newtonian fluid jets in the initial phase of electrospinning

Julian K Liedtke (Institut für Mechanische Verfahrenstechnik, Universität Stuttgart); Carsten Mehring (Institut für Mechanische Verfahrenstechnik, Universität Stuttgart)

11:20 #236: State sensing of bubble jet flow based on acoustic recognition and deep learning

Nao Mikami (Osaka University); Yoshitaka Ueki (Osaka University); Masahiko Shibahara (Osaka University); Kosuke Aizawa (Japan Atomic Energy Agency); Kuniaki Ara (Japan Atomic Energy Agency)

11:40 #197: Exploring differences in second order statistics for the simulation of multi-scale atomization process

Alberto Remigi (SAFRANTECH); Petar Tomov (SAFRAN Aircraft Engines); Marc Massot (CMAP, Ecole Polytechnique); Ludovic Goudenege (Ecole Polythechnique); François-Xavier Demoulin (CORIA); Benjamin Duret (CORIA); Julien Reveillon (CORIA)

12:00 #829: Subgrid-scale modeling of liquid drop bag breakup

Austin H Han (Cornell University); Olivier Desjardins (Cornell University)

S3 Interfacial Flows 11:00−12:20, April 4, Room 504

Session Chair: **Mathis Bode (Forschungszentrum Jülich GmbH)**

11:00 #858: Contact line advection using a finite volume ALE interface tracking method

Suraj Raju (TU Darmstadt); Tomislav Maric (TU Darmstadt); Zeljko Tukovic (University of Zagreb); Dieter Bothe (TU Darmstadt); Mathis Fricke (TU Darmstadt)

11:20 #857: Simulating wetting of geometrically complex surfaces using the unstructured volume-of-fluid method

Muhammad Hassan Asghar (TU Darmstadt); Tomislav Maric (TU Darmstadt); Mathis Fricke (TU Darmstadt); Dieter Bothe (TU Darmstadt)

11:40 #668: An experimental study of flow patterns near a moving contact line

Charul Gupta (IIT Hyderabad); Lakshmana Chandrala (IIT Hyderabad); Harish N Dixit (IIT Hyderabad)

12:00 #120: A new Saint-Venant model for macroscale simulations of moving contact lines

Bastien Delacroix (ONERA); Ghislain Blanchard (ONERA); Maxime Bouyges (ONERA); Claire Laurent (ONERA); Philippe Villedieu (ONERA)

S3 Non-Newtonian Multiphase Flows 11:00−12:20, April 4, Room 505

Session Chair: **Yuji Tasaka (Hokkaido University)**

11:00 #168: Energy spectrum scaling depends on the Re number in polymeric turbulence

Rahul Kumar Singh (Okinawa Institute of Science and Technology); Prasad Perlekar (Tata Institute of Fundamental Research); Dhrubaditya Mitra (KTH Royal Institute of Technology and Stockholm University); Marco E. Rosti (Okinawa Institute of Science and Technology)

11:20 #652: Turbulence modulation in elastoviscoplastic fluid flows

Mohamed S Abdelgawad (Okinawa Institute of Science and Technology); Ianto Cannon (Okinawa Institute of Science and Technology); Marco Edoardo Rosti (Okinawa Institute of Science and Technology)

11:40 #729: Pseudo turbulence in viscoelastic fluids

Mithun Ravisankar (Brown University); Roberto Zenit (Brown University)

12:00 #128: Coalescence and breakup of droplets in a viscoelastic turbulent fluid

Ianto Cannon (Okinawa Institute of Science and Technology); Marco E. Rosti (Okinawa Institute of Science and Technology)

—— Lunch Break (Ariston Hotel Kobe) ——

(Keynote Lecture) **Panagiota Angeli (University College London)** Drop Formation in Microfluidic Channels in the Presence of Surface Active Agents, 13:30−14:10, Main Hall, Chairperson: Dirk Lucas (Helmholtz-Zentrum Dresden - Rossendorf)

(Keynote Lecture) **Zhaosheng Yu (Zhejiang University)** Turbulence Modulation by Heavy Finite-size Particles in Vertical Channel Flows and Development of Two-fluid Models from Interface-Resolved Simulations, 13:30−14:10, Room 301, Chairperson: Toshitsugu Tanaka (Osaka University)

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S4 Particle-Laden Flows 14:20−15:40, April 4, Room 301

Session Chair: **Yutaro Motoori (Osaka University)**

14:20 #329: Turbulence modulation by inertial fibers

Davide Di Giusto (University of Udine); **Cristian Marchioli** (University of Udine)

14:40 #755: Numerical study of aerosol particles collection by falling drops

Emmanuel Reyes (University of Rouen); Thibaut Ménard (University of Rouen); Pascal Lemaitre (IRSN); Emmanuel Belut (INRS)

15:00 #821: Dispersion and clustering of inertial particles in a turbulent round jet

Bianca Viggiano (Polytechnique Montréal); Thomas Basset (Phys. Lab - CNRS); Romain Volk (Phys. Lab - CNRS); Laurent Chevillard (Phys. Lab - CNRS); Mickael Bourgoin (Phys. Lab - CNRS); Raúl B Cal (Portland State University)

15:20 #561: Clustering formation of inertial particles in homogeneous isotropic turbulence

Keigo Matsuda (Japan Agency for Marine-Earth Science and Technology); Thibault Oujia (Institut de Mathématiques de Marseille, Aix-Marseille Université, CNRS); Kai Schneider (Institut de Mathématiques de Marseille, Aix-Marseille Université, CNRS)

S4 OS: Numerical Modeling of Granular and Multiphase Flows 14:20−15:40, April 4, Room 401

Session Chair: **Mikio Sakai (The University of Tokyo)**

14:20 #92: Turbulence effect on clustering in bubble swarms using DNS and front-tracking

Alan Burlot (CEA Paris-Saclay); Gabriel Ramirez (CEA Paris-Saclay); Frédéric Risso (CNRS-IMFT); Guillaume Bois (CEA Paris-Saclay); Rémi Zamansky (IMFT)

14:40 #554: A temperature-tracking polydisperse Gaussian-moment model for evaporating multiphase flows

Benoit J Allard (University of Ottawa); James McDonald (University of Ottawa); Lucian Ivan (Canadian Nuclear Laboratories)

15:00 #432: Eulerian multi-fluid PBM simulations of dense gas-liquid flow in a bubble column

Sujata Sen (IIT Delhi); Vivek V. Buwa (IIT Delhi)

15:20 #404: Influence of lift force in CFD modeling of liquid-solid flow in an inclined fluidized bed

Priyabrata Puhan (IIT Kharagpur); Asim Mukherjee (Tata Steel Ltd.); Arnab Atta (Indian Institute of Technology Kharagpur)

S4 Modelling of Multiphase Flows 14:20−15:40, April 4, Room 402

Session Chair: **Sébastien Tanguy (Université Paul Sabatier - Toulouse)**

14:20 #143: A model for tracking superellipsoidal particles in multiphase flows

Mitja Štrakl (University of Maribor); Jana Wedel (Friedrich-Alexander Universität Erlangen Nürnberg); Matjaz Hribersek (University of Maribor, Faculty of Mechanical Engineering); Paul Steinmann (Chair of Applied Mechanics, Friedrich-Alexander University Erlangen-Nürnberg); **Jure Ravnik** (University of Maribor)

14:40 #386: Assessment of point-particle models for non-spherical particles in turbulent flow

Laurent André (RWTH Aachen University); Thede Peter Kiwitt (RWTH Aachen University); **Matthias Meinke** (RWTH Aachen University); Wolfgang Schröder (RWTH Aachen University)

15:00 #462: Understanding the motion of selected dry-coated powders in swirl-based dry powder inhalation devices

Francesca O Alfano (University of Calabria); Alberto Di Renzo (University of Calabria); Francesco Paolo Di Maio (University of Calabria)

15:20 #606: Wavelet-based kinematic simulation of particle-laden flows

Roxane Letournel (Safran); Marc Massot (CMAP, Ecole Polytechnique); Aymeric Vié (EM2C, CentraleSupélec)

S4 Experimental Methods for Multiphase Flows 14:20–15:40, April 4, Room 403

Session Chair: **Yuki Mizushima (Shizuoka University)**

14:20 #348: Can optical flow method be used to obtain velocities of liquid droplets in a multiphase flow?

Avick Sinha (UNIVERSITY OF NOTTINGHAM); Benjamin Pamplin (UNIVERSITY OF NOTTINGHAM); Kathy Johnson (UNIVERSITY OF NOTTINGHAM); **David Hann** (UNIVERSITY OF NOTTINGHAM)

14:40 #218: 3D-PTV measurements of vortex-flow reversal in sessile drops due to shear flow

Sebastian Burgmann (University Wuppertal); Clemens Bilsing (TU Dresden); Martin Rohde (University Wuppertal); Lars Büttner (TU Dresden); Jürgen Czarske (TU Dresden); Uwe Janoske (University Wuppertal)

15:00 #832: Visualization of flow structures in a rectangular spouted bed by neutron imaging

Yasushi Saito (Institute for Integrated Radiation and Nuclear Science, Kyoto University); Daisuke Ito (Institute for Integrated Radiation and Nuclear Science, Kyoto University); Naoya Odaira (Kyoto University); Kei Ito (Kyoto University); Keisuke Kurita (Japan Atomic Energy Agency); Hiroshi Iikura (Japan Atomic Energy Agency)

15:20 #352: Analysis of the influence of the continuous on the dispersed phase in a two-phase liquid-liquid dispersion in rotating conditions using piv and hsi

Rodolfo M. Perissinotto (University of Campinas); Rafael Franklin Lazaro de Cerqueira (UNICAMP/CEPETRO/ALFA); William Denner Pires Fonseca (UNICAMP); William Monte Verde (Center for Petroleum Studies); Jorge Biazussi (University of Campinas); Erick Franklin (University of Campinas); Antonio Bannwart (University of Campinas); Marcelo S Castro (UNICAMP)

S4 OS: Industrial Applications 14:20–15:40, April 4, Room 404

Session Chair: **Isao Kataoka (Institute of Nuclear Safety System)**

14:20 #455: Modeling simulation assisted optimal process control for sandblasting operation

Nguyen Van Bo (ASTAR); Si Bui Quang Tran (ASTAR); Henry Kou Feng Cheng (ASTAR); Ahluwalia Kunal(ASTAR); Chow Cher Wong(ASTAR); Victor Quek(ASTAR); Kterry Tan (ASTAR); ang Chang Wei (ASTAR)

14:40 #154: Numerical modeling and simulation of transport and deposition of dust particles on ground mounted photovoltaic arrays

Cheikhna Talebmoustaph (TotalEnergies); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT)); Maxime Pallud (TotalEnergies); Priyank Maheshwari (TotalEnergies)

15:00 #334: Thermocatalytic decomposition of methane in a fluidized bed – experimental study of fluidization of growing catalyst particles

Morteza Hadian (Eindhoven university of Technology); Danny Marrevee (Eindhoven university of Technology); **Kay Buist** (Eindhoven University of Technology); Bernard Reesink (BASF); Rene Bos (Shell); Sander van Bavel (Shell); Hans Kuipers (Eindhoven University of Technology)

15:20 #243: Influence of a co-flow on the velocity field of a particle-laden jet issuing into a confined tube

Elliott W Lewis (University of Adelaide); Zhiwei Sun (University of Adelaide); Matthew Gill (Calix Ltd.); Matthew Boot-Handford (Calix Ltd.); Mark Sceats (Calix Ltd.); Graham Nathan (University of Adelaide)

S4 Collision, Agglomeration and Breakup 14:20−15:20, April 4, Room 405

Session Chair: **Martin Sommerfeld (Otto-von-Guericke-Universität Magdeburg)**

14:20 #772: Early and late splashes during drop impact onto a quiescent liquid film

Tomio Okawa (The University of Electro-Communications); Katsuyuki Kawa (The University of Electro-Communications); Kohei Kubo (The University of Electro-Communications)

14:40 #770: CFD-DEM model of cohesive particle collision

Nazerke Saparbayeva (Western Norway University of Applied Sciences); Pavel Struchalin (Western Norway University of Applied Sciences); Boris V Balakin (Western Norway University of Applied Sciences)

15:00 #336: Rate kinetics of agglomeration and deagglomeration of nanoparticles using DEM

Alok Tiwari (IIT Bombay); Manaswita Bose (IIT Bombay)

S4 Cavitation/Nucleation 14:20−15:40, April 4, Room 406

Session Chair: **Steven Ceccio (University of Michigan)**

14:20 #639: Numerical simulation of the Rayleigh collapse of two bubbles near a solid wall

Baudouin Fonkwa Kamga (University of Michigan Ann Arbor); Eric Johnsen (University of Michigan Ann Arbor)

14:40 #630: Wall-bounded cavitation bubble dynamics using a sharp-interface level-set method

Alexander Bußmann (Technical University of Munich); Stefan Adami (Technical University of Munich); Nikolaus Adams (Technical University of Munich)

15:00 #595: Numerical study on the collapse of a bubble cloud attached to a solid wall

Kohei Okita (Nihon University); Yuusuke Miyamoto (KOMATSU); Teruyuki Furukawa (KOMATSU); Shu Takagi (The University of Tokyo)

15:20 #682: Direct numerical simulation of two-phase compressible flows with phase change

Marie Bibal (Institut de Mécanique des Fluides de Toulouse); Maxence Deferrez (Isae Supaero); Annafederica Urbano (Isae Supaero); Sebastien Tanguy (Institut de Mécanique des Fluides de Toulouse)

S4 OS: Bubbles and Drops (Bubbles) 14:20−15:40, April 4, Room 501

Session Chair: **Dirk Lucas (Helmholtz-Zentrum Dresden-Rossendorf)**

14:20 #241: Characterization of dynamic features of bubbly flow rising in a slightly inclined vertical pipe: a three-dimensional numerical study

Yijie Liu (The university of Tokyo); Shu Takagi (The University of Tokyo); Kazuyasu Sugiyama (Osaka University)

14:40 #644: Effect of polydispersity and bubble clustering on the steady shear viscosity of dilute bubble suspensions in Newtonian media

Stamatina Mitrou (UCL); Simona Migliozzi (University College London); Panagiota P Angeli (UCL); Luca Mazzei (UCL)

15:00 #138: Bubble kinematics in polydisperse confined swarms

Javier Ruiz-Rus (Institut de Mécanique des Fluides de Toulouse); Carlos Martínez-Bazán (University of Granada); Patricia Ern (Institut de Mécanique des Fluides de Toulouse); Véronique Roig (Institut de Mécanique des Fluides de Toulouse)

15:20 #708: The conflict of bubbles and droplets: a model for the interaction of the two phases

Madeline E Federle (Brown University); Roberto Zenit (Brown University)

S4 OS: Boiling, Condensation, Evaporation 14:20–15:40, April 4, Room 502

Session Chair: **Gherhardt Ribatski (University of Sao Paulo)**

14:20 #121: Towards modeling the impact of the aspect ratio in an energy model describing the transient flow boiling crisis at high subcooling

Elie Roumet (CEA); Raksmy Nop (CEA); Nicolas Dorville (CEA); Marie-Christine Duluc (CNAM)

14:40 #156: Towards a fully physics-based 1D CFD model for the depressurization of pipes with liquid-gas phase change

Alexandra M Log (NTNU); Morten Hammer (SINTEF Energy Research); Svend Tollak Munkejord (SINTEF Energy Research)

15:00 #454: Identification of boiling regimes through boiling induced vibrations using decision tree classifier

Venkata Sreeram Sarma Barathula (Indian Institute of Technology Madras); S K Chaitanya (Indian Institute of Technology Madras); K Srinivasan (Indian Institute of Technology Madras)

15:20 #662: Evaluation of condensation models on TOPFLOW experiment

Tanguy Herry (Commissariat à l'énergie atomique); Bruno Raverdy (Commissariat à l'énergie atomique); Stephane Mimouni (Electricite de France)

S4 Computational Techniques for Multiphase Flows 14:20–15:40, April 4, Room 503

Session Chair: **Maike Baltussen (Eindhoven University of Technology)**

14:20 #153: Interfacial mass transfer based on a geometric volume of fluid solver

Alexis Tourbier (IFPEN); Lionel Gamet (IFPEN); Typhene Michel (IFPEN); Philippe Beard (IFPEN); Joelle Aubin (Universite de Toulouse); Hrvoje Jasak (Wikki Ltd)

14:40 #220: A symmetric filamentary approach to the moment-of-fluid method

Philippe Hergibo (Cardiff University); Timothy Phillips (Cardiff University); Zhihua Xie (Cardiff University)

15:00 #383: Simulating three-dimensional two-phase flows subject to surface tension with piecewise parabolic interface reconstruction

Fabien Evrard (Otto-von-Guericke University Magdeburg); Robert Chiodi (Los Alamos National Laboratory); Berend van Wachem (University of Magdeburg); Olivier Desjardins (Cornell University)

15:20 #734: A coupling VOF/embedded boundary method to model contact angles on arbitrary solid surfaces

Mathilde B Tavares (LadHyX, Ecole polytechnique); Christophe Josserand (LadHyX, CNRS & E. Polytechnique); Alexandre Limare (Institut Jean Le Rond d'Alembert, Sorbonne Université); José Maria Lopez Herrera Sanchez (Universidad de Sevilla, Ingenieria Aerospacial y Mecanica de Fluidos); Stéphane Popinet (Institut Jean Le Rond d'Alembert, Sorbonne Université)

S4 Interfacial Flows 14:20−15:40, April 4, Room 504

Session Chair: **Pierre Trontin (Lyon 1 University)**

14:20 #323: Characterization of a capillary driven flow in microgravity by means of optical techniques

Domenico Fiorini (von Karman Institute for Fluid Dynamics); Louis Carbonnelle (von Karman Institute for Fluid Dynamics); Alessia Simonini (von Karman Institute for Fluid Dynamics); Johan Steelant (European Space Agency); David Seveno (KU Leuven); Miguel Mendez (von Karman Institute for Fluid Dynamics)

14:40 #640: New perspectives on capillary rise from complexity reduced models

Mathis Fricke (TU Darmstadt); Suraj Raju (TU Darmstadt); El Assad Ouro-Koura (TU Darmstadt); Joël De Coninck (Université libre de Bruxelles); Dieter Bothe (TU Darmstadt)

15:00 #678: Dynamic surface tension of molten solder in oxidative environment

Tatsuro Wakimoto (Osaka Metropolitan University); Kenji Katoh (Osaka Metropolitan University); Yoshiaki Ueda (Setsunan University); Manabu Iguchi (Osaka Metropolitan University)

15:20 #299: Pinhole growth in a coated liquid film on a non-wetting substrate

Shunji Homma (Saitama University); Takumi Chiba (Saitama University); Ryota Nakajima (Saitama University)

S4 Non-Newtonian Multiphase Flows 14:20−15:40, April 4, Room 505

Session Chair: **Yuji Tasaka (Hokkaido University)**

14:20 #290: Interfacial instabilities during two-phase liquid displacement of pure viscoelastic liquid in microchannels

Seng Hoe Hue (Chemical Engineering, University College London); Loïc Chagot (University College London (UCL)); Panagiota P Angeli (UCL)

14:40 #663: The effect of absolute viscosity on the flow patterns and pressure gradient of gas - liquid-non-Newtonian two-phase flow in square microchannels

Deendarlianto Deendarlianto (Universitas Gadjah Mada); Haslinda Kusumaningsih (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada); indarto indarto (Universitas Gadjah Mada); Sugiyono Sugiyono (Universitas Gadjah Mada)

15:00 #295: Closed top draining of shear-thinning liquids in millichannels

Priyanka (IIT Kharagpur); Banashree Samanta (IIT Kharagpur); **Gargi Das** (IIT Kharagpur); Subhabrata Ray (BIT Mesra); Manish Kaushal (IIT Kharagpur)

15:20 #247: Numerical investigations of Newtonian/non-Newtonian liquid-liquid slug flow in microchannel

Deepak Vilayil (Indian Institute of Technology Madras); S Vengadesan (Indian Institute of Technology Madras)

—— Coffee Break ——

S5 Particle-Laden Flows 16:00−17:20, April 4, Room 301

Session Chair: **Yutaro Motoori (Osaka University)**

16:00 #51: Phenomenology and modeling of bow shock perturbation in particle-gas flows

Julien Amorosetti (CEA-CESTA); Jean-Philippe Braeunig (CEA-CESTA); David Hebert (CEA-CESTA)

16:20 #84: Two-phase flow simulations of gas-solid flow in a conical diffuser

Aldo G Benavides-Moran (Universidad Nacional de Colombia); Brian Quintero (Universidad Autonoma de Occidente); Santiago Lain (Universidad Autonoma de Occidente)

16:40 #81: Acoustic streaming in acoustic particle fractionation assisted by electric fields

Krischan Sandmann (Leibniz Institute of Materials Engineering); Udo Fritsching (University Bremen)

17:00 #147: Euler-Euler simulation of co-current solid-liquid flow in a vertical pipe

Mazen Draw (Helmholtz-Zentrum Dresden-Rossendorf e.V.); Roland Rzehak (Helmholtz-Zentrum Dresden-Rossendorf e.V.)

S5 OS: Numerical Modeling of Granular and Multiphase Flows 16:00−17:20, April 4, Room 401

Session Chair: **Mikio Sakai (The University of Tokyo)**

16:00 #276: Robust conservative Allen-Cahn lattice Boltzmann model for multi-phase flow simulations

Seyed Ali Hosseini (OvGU); Dominique Thévenin (OvGU)

16:20 #632: Lattice Boltzmann simulations of droplet permeation through membranes

Yasushi Mino (Okayama University); Ayano Hasegawa (Kobe University); Toru Ishigami (Hiroshima University); Hideto Matsuyama (Kobe University)

16:40 #316: On the influence of poly-disperse systems on pressure drop in packed beds: LBM-DEM

Isabel F Latimer (University of Leeds); Timothy Hunter (University of Leeds); Michael Fairweather (University of Leeds); Jeffrey Peakall (University of Leeds); David Harbottle (University of Leeds); Martyn Barnes (Sellafield Ltd)

17:00 #304: A study on liquid film dynamics using two-phase flow simulation with AMR method

Tongda Lian (Tokyo Institute of Technology); Shintaro Matsushita (Tokyo Institute of Technology); Takayuki Aoki (Tokyo Institute of Technology)

S5 Modelling of Multiphase Flows 16:00−17:20, April 4, Room 402

Session Chair: **Alberto Di Renzo (University of Calabria)**

16:00 #756: Simulations of the flow of viscous oil with water in a horizontal pipe

Haoyu Li (Delft University of Technology); M.J.B.M. Pourquie (Delft University of Technology); G. Ooms (Delft University of Technology); Ruud Henkes (Delft University of Technology)

16:20 #194: Phase inversion modeling in oil-water-gas three-phase annular-duct flow

Johann E Castro (University of São Paulo); Oscar Rodriguez (University of São Paulo)

16:40 #710: Simulation of two-phase air / water flows in bubbly flow in horizontal pipe

Bruno Raverdy (CEA)

17:00 #661: Modelling of stratified flows and slug flow transition with an all flow regime CFD model

Marco Colombo (University of Sheffield)

S5 Experimental Methods for Multiphase Flows 16:00−17:20, April 4, Room 403

Session Chair: **David Hann (The University of Nottingham)**

16:00 #159: The use of optically active particles in flow visualization

Vladislav Rinsky (Technion - Israel Institute of Technology); Subhani Shaik (Technion - Israel Institute of Technology); Rene van Hout (Technion - Israel Institute of Technology)

16:20 #163: Particle detection in the slurry by using the optical visualization method

Guangxin Ding (Gyeongsang National University); Han Van Nguyen (Gyeongsang National University); Yubo Jin (Gyeongsang National University); Hyoung-Bum Kim (Gyeongsang National University)

16:40 #288: Turbulent kinetic energy in stirred tanks estimated with an alternative approach: Tilted PIV

Aline G De Mitri (Process Engineering Department, School of Chemical Engineering, University of Campinas); Rodrigo de L. Amaral (Department of Mechanical Engineering, Polytechnic School, University of São Paulo); Helder L. de Moura (Center for Petroleum Studies, University of Campinas); Guilherme Castilho (Universidade Estadual de Campinas)

17:00 #321: Interferometric particle imaging for bubble-size estimations in thin annular gap-flows

Christian Alexander Sax (Karlsruhe Institut of Technology); Robin Leister (Karlsruhe Institut of Technology); Andreas Bruemmer (Technical University Dortmund); Jochen Kriegseis (Karlsruhe Institut of Technology)

S5 OS: Fundamentals and Applications of Fine Bubble Technology 16:00−17:00, April 4, Room 404

Session Chair: **Hisato Minagawa (The University of Shiga Prefecture)**

16:00 #265: Coupling effects of ionic surfactants and electrolytes on the stability of bulk nanobubbles

Xiaotong Ma (Tsinghua University); Mingbo Li (Tsinghua University); Xuefei Xu (Tsinghua University); Chao Sun (Tsinghua University)

16:20 #498: Local mass transfer phenomena of fine bubbles in biocatalytic processes

Lotta Kursula (Hamburg University of Technology); Zeynep Percin (Hamburg University of Technology); Marko Hoffmann (Hamburg University of Technology); Andreas Liese (Hamburg University of Technology); Koichi Terasaka (Keio University); Michael Schluter (Hamburg University of Technology)

16:40 #764: Ultrafine bubble generation in condensate of steam accompanying with gas

Koichi Terasaka (Keio University); Kota Taguchi (Keio University); Satoko FUJIOKA (Keio University); Tomoya Tetsuka (Keio University)

S5 Droplet Flows 16:00–17:40, April 4, Room 405

Session Chair: **Yamamoto Ryoichi (Kyoto University)**

16:00 #215: Micro-droplet generation via marangoni bursting

Stefan Puttinger (Johannes Kepler University Linz); Mahdi Saeedipour (Johannes Kepler University)

16:20 #361: A 3D numerical analysis for a effect of a magnetic field on breakup of a ferrofluid droplet in simple shear flow

Yuto Kawabata (Kobe University); Shunichi Ishida (Kobe University); Yohsuke Imai (Kobe University)

16:40 #656: Rheology of ferrofluid droplet suspension in wall-bounded shear flow

Shunichi Ishida (Kobe University); Daiki Matsunaga (Osaka University)

17:00 #49: Numerical study of 3D flow instabilities in spherical droplets

Godé Hadrien (CEA); Eric Climent (IMFT); Charton Sophie (CEA); Legendre Dominique (IMFT)

17:20 #707: Conditional measurement of droplet size within droplet clusters in polydisperse sprays

Nandhakumar Pandurangan (Indian Institute of Technology); Srikrishna Sahu (Indian Institute of Technology)

S5 Cavitation/Nucleation 16:00–17:40, April 4, Room 406

Session Chair: **Steven Ceccio (University of Michigan)**

16:00 #45: On bubble cloud growth in shock-droplet interaction

Kevin Schmidmayer (Inria); Luc Biasiori-Poulanges (ETH Zurich)

16:20 #317: Cavitation inside droplets induced by shocks

Jose Rodolfo Chreim (California Institute of Technology); Mauro Rodriguez (Brown University); Tim Colonius (Caltech)

16:40 #170: Multiscale simulation of bubble cloud formation by high-intensity focused ultrasound using the ghost fluid method coupled with bubble dynamics

Mebuki Nakao (Osaka Prefecture University); **Hideki Yamauchi** (Osaka Prefecture University); Toshiyuki Ogasawara (Osaka Metropolitan University); Hiroyuki Takahira (Osaka Metropolitan University)

17:00 #515: Numerical simulations of inertial cavitation at a compliant object interface

Mauro Rodriguez (Brown University); Jin Yang (University of Texas at Austin); Jonathan Estrada (University of Michigan)

17:20 #171: The scaling law in bubble size distribution at early stage of cloud cavitation

Yunqiao Liu (Shanghai Jiao Tong University); Hao Zhang (Shanghai Jiao Tong University); Wei Zhang (Shanghai Jiao Tong University); Benlong Wang (Shanghai Jiao Tong University)

S5 OS: Bubbles and Drops (Bubbles) 16:00–17:20, April 4, Room 501

Session Chair: **Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)**

16:00 #490: On free rising skirt bubble

Dominique Legendre (IMFT - Toulouse)

16:20 #79: The lift force of ellipsoidal bubbles in water and the influence of surfactants on it

Hendrik Hessenkemper (Helmholtz-Zentrum Dresden-Rossendorf); Dirk Lucas (Helmholtz-Zentrum Dresden-Rossendorf); Akio Tomiyama (2 Graduate School of Engineering, Kobe University)

16:40 #250: Electrohydrodynamics of bubble rising

Darshan Patel (Indian Institute of Technology Madras); S Vengadesan (Indian Institute of Technology Madras)

17:00 #221: Numerical analysis of bubble cutting

Rahul Subburaj (TU/e); Yali Tang (Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology)

S5 OS: Boiling, Condensation, Evaporation 16:00–17:40, April 4, Room 502

Session Chair: **Gherhardt Ribatski (University of Sao Paulo)**

16:00 #381: Validation of Eulerian two-phase flow module in SNERDI computational fluid dynamics software (SCFD) for nuclear power engineering

Chang Sun (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Haoran Hao (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Dongsheng Zhang (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Bing Ren (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Fujun Gan (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Yanrong Shen (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Qian Hong (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd); Bo Yang (Shanghai Nuclear Engineering Research and Design Institute Co.Ltd)

16:20 #731: Multiphase-CFD simulation of steam chugging by the volume of fluid method

Marco Pellegrini (The University of Tokyo); Shuichiro Miwa (The University of Tokyo); Shunichi Suzuki (The University of Tokyo); Koji Okamoto (The University of Tokyo)

16:40 #392: Liquid microlayer formation beneath a vapour bubble growing at a heated substrate: interface-capturing CFD simulations and fluorescence microscopy experiments

Giovanni Giustini (The University of Manchester); Suryanarayan Lakshminarayan (Imperial College London); Aleksei Lobasov (Imperial College London); Konstantin S. Pervunin (Imperial College London); Christos Markides (Imperial College London)

17:00 #607: Finite-size evaporation droplets in weakly compressible homogeneous turbulence with droplet-resolved DNS

Salar Zamani Salimi (Norwegian University of Science and Technology); Nicolo Scapin (KTH University); Andrea Gruber (SINTEF Energy Research); Luca Brandt (KTH university)

17:20 #655: Numerical analysis of the break-up behavior of homogeneous droplet by puffing

Fumiya Kidena (Kyoto university); Kenya Kitada (Kyoto University); Abhishek L. Pillai (Kyoto university); Ryoichi Kurose (Kyoto university)

S5 Computational Techniques for Multiphase Flows 16:00−17:40, April 4, Room 503

Session Chair: **Marica Pelanti (ENSTA Paris)**

16:00 #206: A sharp front tracking method based on geometric interface reconstruction

Christian Gorges (University of Magdeburg); Fabien Evrard (Otto-von-Guericke University Magdeburg); Robert Chiodi (Los Alamos National Laboratory); Berend van Wachem (University of Magdeburg); Fabian Denner (University of Magdeburg)

16:20 #257: A novel front tracking – immersed boundary method (FT-IBM) for multiphase flows.

Maike Baltussen (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

16:40 #855: ACoolTPS – advanced cooling of high power microsystems using two-phase flows systems in complex geometries

Gustavo R. Anjos (Coppe/UFRJ); Prashant Valluri

17:00 #192: Slip boundary condition in the contact line region of laminar two-phase separated flow

Ayelet Goldstein (Braude-College of Engineering); Ofer Eyal (Braude-Academic College); Amos Ullmann (Tel-Aviv University); Neima Brauner (Tel-Aviv University)

17:20 #318: Local behavior near corners: triple points in laminar two-phase flow and other examples

Ofer Eyal (Braude-Academic College); Ayelet Goldstein (Braude-College of Engineering)

S5 Interfacial Flows 16:00−17:40, April 4, Room 504

Session Chair: **Dieter Bothe (Technische Universität Darmstadt)**

16:00 #463: Experimental investigations of particle scale liquid distribution in packed bed reactors: effect of particle shape and particle arrangement

Devesh Saxena (IIT Delhi); Vivek V. Buwa (IIT Dehi)

16:20 #766: Investigation of plug hole vortices during the drainage of water from a rectangular tank using two outlets

Rahul Kumar Mondal (IIT MANDI); Parmod Kumar (IIT MANDI)

16:40 #667: Ultrasonic atomization characterized by protruding free surface to emanating beads fountain prior to mist spreading

Xiaolu Wang (Doshisha University); **Katsumi Tsuchiya** (Doshisha University)

17:00 #778: Numerical study of film thickness in gas-liquid counter current annular flow

Samiksha Samiksha (Indian institute of technology Roorkee); Sumana Ghosh (Indian institute of technology Roorkee); **Shabina Khanam** (Indian institute of technology Roorkee)

17:20 #804: Experimental study on gas entrainment by bathtub vortex

Kei Ito (Kyoto University); Daisuke Ito (Kyoto University); Naoya Odaira (Kyoto University); Yasushi Saito (Institute for Integrated Radiation and Nuclear Science, Kyoto University); Kelei Song (Kyoto University); Toshiki Ezure (Japan Atomic Energy Agency); Kentarou Matsushita (Japan Atomic Energy Agency); Masaaki Tanaka (Japan Atomic Energy Agency)

S5 OS: Bubbles and Drops (Drops) 16:00−17:40, April 4, Room 505

Session Chair: **Michael Booty (New Jersey Institute of Technology)**

16:00 #476: Aerosol generation by bubbles bursting at the interface of a faucet water jet

Antonella Succar (Polytechnique Montreal); Emilie Bédard (Polytechnique Montreal); Michele Prevost (Ecole Polytechnique de Montreal); Etienne Robert (Polytechnique Montreal)

16:20 #131: Morphological characterization of 3D spray droplets

Victor Chéron (CORIA); **Jorge César Brändle de Motta** (CORIA); Jean-Bernard Blaisot (CORIA); Thibault Ménard (CORIA)

16:40 #377: Curvature-surface analysis to characterize the early stage of the atomization process of the pressure swirl injector

Diego Ferrando (Université de Rouen Normandie); **Chetankumar S. Vegad** (Universitñe de Rouen Normandie); Saïd Idlahcen, (Université de Rouen Normandie); Aalexis Vandel (Université de Rouen Normandie); Bruno Renou (Université de Rouen Normandie); Gilles Godard (Université de Rouen Normandie); Gilles Cabot (Université de Rouen Normandie); Jean-Bernard Blaisot (Université de Rouen Normandie); Benjamin Duret (Université de Rouen Normandie); Julien Reveillon (Université de Rouen Normandie); François-Xavier Demoulin (Université de Rouen Normandie)

17:00 #337: Synchotron X-ray radiography of ultrasonic droplet fragmentation

Anunay Prasanna (ETH Zurich); Luc Biasiori-Poulanges (ETH Zurich); Ya-Chi Yu (ETH Zurich); Hazem El-Rabii (Institut Pprime, ISAE ENSMA); Outi Supponen (ETH Zurich)

17:20 #65: Numerical study of drop deformation and fragmentation in liquid-liquid configuration

Linkai Wei (IRSN); **Renaud Meignen** (IRSN); Nicolas D. Rimbert (Université de Lorraine)

Wednesday, April 5, 2023

Gad Hetsroni (Senior) Award Lecture 9:00−9:50, Main Hall

Andrea Prosperetti (Junior) Award Lecture 10:00−10:40 Main Hall

—— Coffee Break ——

S6 Particle-Laden Flows 11:00−12:40, April 5, Room 301

Session Chair: **Cristian Marchioli (University of Udine)**

11:00 #465: Transient velocity correction in the volume-filtered Euler-Lagrange modeling of wall-bounded particle-laden flows

Akshay Chandran (Otto-von-Guericke Universitaet); Fabien Evrard (Otto-von-Guericke University Magdeburg); Berend van Wachem (University of Magdeburg)

11:20 #60: Stochastic Lagrangian and PDF Eulerian modelling of particles in multiphase flows

Federico Baraglia (EDF); Jérôme Laviéville (EDF); Nicolas Mérigoux (EDF); Olivier Simonin (IMFT)

11:40 #130: A stochastic Lagrangian subgrid-scale model for capturing two-point statistics

Max P Herzog (University of Michigan); John Wakefield (University of Michigan); Jesse Capecelatro (University of Michigan)

12:00 #521: Interphase coupling in polydisperse evaporating sprays using the generalised fully Lagrangian approach

Christopher P Stafford (University of Brighton); Oyuna Rybdylova (University of Brighton)

12:20 #519: Recent developments in a kinetic theory for gas-particle flows

Christopher P Stafford (University of Brighton); David Swailes (Newcastle University); **Michael W Reeks** (Newcastle University)

S6 OS: Numerical Modeling of Granular and Multiphase Flows 11:00−12:20, April 5, Room 401

Session Chair: **Wei Pin Goh (University of Leeds)**

11:00 #368: A particle-size dependent smoothing scheme for polydisperse Euler-Lagrange simulations

Chih-Chia Huang (Eindhoven University of Technology); Jeroen van Oijen (Eindhoven University of Technology); **Niels G Deen** (Eindhoven University of Technology); Yali Tang (Eindhoven University of Technology)

11:20 #355: Development of a numerical simulation model for solid-gas-liquid-liquid four-phase flow

Toru Ishigami (Hiroshima University); Ayumu NIshii (Hiroshima University); Tomonori Fukasawa (Hiroshima University); Kunihiro Fukui (Hiroshima University)

11:40 #78: On the modeling of RANS turbulent and LES subgrid fluid-particle drift velocity in dilute and moderately dense dispersed two-phase flows

Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT)); Baptiste Hardy (Institut de Mecanique des Fluides de Toulouse (IMFT)); Pascal Fede (Institut de Mecanique des Fluides de Toulouse (IMFT))

12:00 #861: About the dynamics of a simplified metal-gas-oxide system

Sergey Semenov (SIMTEC); Anne Boulin (CEA); Jean-Francois Haquet (CEA); **Mickael Antoni** (Aix-Marseille University)

S6 Modelling of Multiphase Flows 11:00−12:40, April 5, Room 402

Session Chair: **François-Xavier Demoulin (University of Rouen Normandy)**

11:00 #29: A coupled CFD model of lyophilization for the laboratory freeze dryer case

Blaz Kamenik (University of Maribor, Faculty of Mechanical Engineering); Matej Zadravec (University of Maribor, Faculty of Mechanical Engineering); Jure Ravnik (University of Maribor); **Matjaz Hribersek** (University of Maribor, Faculty of Mechanical Engineering)

11:20 #176: High-fidelity modeling of the drying kinetics and lifetimes of saliva droplets in airborne transmission of COVID-19

Gizem Özler (physikalisch technische bundesanstalt); Holger Grosshans (physikalisch technische bundesanstalt)

11:40 #395: Particle-resolved study of wetting in a trickle bed reactor

Arvin Tavanaei (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

12:00 #261: Hydrodynamics inside packed beds of spherocylinders; magnetic resonance imaging and pore network modelling approaches

Ali Fathiganjehlou (TU Eindhoven); Noah Romijn (TU Eindhoven); Y.E.I. (Yasmine) Bergmans (TU Eindhoven); E.A.J.F. (Frank) Peters (TU Eindhoven); Maike Baltussen (Eindhoven University of Technology); K.A. (Kay) Buist (TU Eindhoven); J.A.M. (Hans) Kuipers (TU Eindhoven)

12:20 #610: Pore network modeling of packed beds of non-spherical particles

Amirhossein Eghbalmanesh (Eindhoven University of Technology); Ali Fathiganjehlou (TU Eindhoven); Martijn Hoogendoorn (Eindhoven University of Technology); Marijana Miloshevska (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology); Frank Peters (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

S6 Experimental Methods for Multiphase Flows 11:00−12:40, April 5, Room 403

Session Chair: **Hideki Murakawa (Kobe University)**

11:00 #125: STORMFLOW: a STOchastic geometRical model for Multiphase FLOW characterization

Léo Théodon (”Ecole Nationale Supérieure des Mines, Saint-Etienne, FRANCE”); Kassem Dia (CEA); Johan Debayle (”Ecole Nationale Supérieure des Mines, Saint-Etienne, FRANCE”); **Fabrice Lamadie** (CEA)

11:20 #840: Experimental analysis of the influence of gas density on two-phase slug flow in a horizontal pipe

Bruna P Naidek (NUEM - UTFPR); Matheus Pereira (NUEM - UTFPR); Roberto Fonseca Júnior (CENPES/PDIEP/EE Petrobrás); Moisés Marcelino Neto (NUEM - UTFPR); Rigoberto E. M. Morales (NUEM - UTFPR)

11:40 #82: Coalescence investigations in small scale continuously operated setup

Mark W. Hlawitschka (Johannes-Kepler-University Linz); D. Danner (Johannes-Kepler-University Linz)

12:00 #198: Volumetric fraction, pressure gradients and flow patterns in inclined dense-gas/liquid pipe flow

Carlos Mauricio Ruiz-Diaz (University of São Paulo); Cristhian E Alvarez-Pacheco (University of São Paulo, Industrial Multiphase Flow Laboratory (LEMI)); Oscar Rodriguez (University of São Paulo)

12:20 #279: Experimental study of liquid/dense-gas flow patterns, pressure gradient, and holdup

André M Quintino (University of São Paulo); Oscar Rodriguez (University of São Paulo)

S6 OS: Fluidization 11:00−12:40, April 5, Room 404

Session Chair: **Olivier Masbernat (CNRS / Toulouse INP)**

11:00 #278: Modeling a fluidized bed of growing catalyst particles: coupling CFD-DEM with MGM

Morteza Hadian (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

11:20 #376: CFD-DEM simulation of continuous particle drying in a countercurrent fluidized bed fitted with large hole perforated plates

Kuang-Sin Pan (National Taiwan University); An-Ni Huang (Chang Gung University); Wan-Yi Hsu (Chang Gung University); **Hsiu-Po Kuo** (National Taiwan University)

11:40 #489: Coarse graining strategy for DEM modelling of triboelectric charging in circulating fluidized bed riser

Erasmo Salvatore Napolitano (University of Calabria); **Alberto Di Renzo** (University of Calabria); Francesco Paolo Di Maio (University of Calabria)

12:00 #495: Investigating the (de-)fluidization behavior of combusted iron fines in a fluidized bed using coupled CFD-DEM

Xin Liu (Power and Flow, Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology); Yali Tang (Eindhoven University of Technology)

12:20 #775: Density segregation of granular materials in vibrated gas-fluidized bed (influence of gas inflow and vibration conditions)

Takuya Tsuji (Osaka University); Yuu Nogami (Osaka University); Jiang Zhaohua (Osaka University); Jun Oshitani (Okayama University of Science); Kimiaki Washino (Osaka University); Toshitsugu Tanaka (Osaka University)

S6 Droplet Flows 11:00−12:40, April 5, Room 405

Session Chair: **Shunichi Ishida (Kobe University)**

11:00 #74: Spreading dynamics during single droplet impact onto a free-standing cubic surface element

Anne K. Geppert (University of Stuttgart, Institute of Aerospace Thermodynamics); Bernhard Weigand (University of Stuttgart, Institute of Aerospace Thermodynamics)

11:20 #437: Understanding the dynamics of underliquid drop spreading

Debarshi Debnath (Indian Institute of Technology Mandi); Sirshendu Misra (University of Waterloo); **Parmod Kumar** (IIT Mandi); Sushanta Mitra (University of Waterloo);

11:40 #523: Volumetric reconstruction of drop impact dynamics by means of color-coded glare points and deep learning

Maximilian Dreisbach (Karlsruhe Institute of Technology); Sebastian Blessing (Institute of Fluid Mechanics (ISTM) - Karlsruhe Institute of Technology (KIT)); Alexander Stroh (Institute of Fluid Mechanics, Karlsruhe Institute of Technology); Jochen Kriegseis (Institute of Fluid Mechanics, Karlsruhe Institute of Technology)

12:00 #230: Experimental and numerical study of droplet behavior in channel flows with and without obstacles

Veronika Krämer (Robert Bosch GmbH); Martin Rohde (University Wuppertal); Sebastian Burgmann (University Wuppertal); Simon Rentschler (Robert Bosch GmbH); Christopher Holzknecht (Robert Bosch GmbH); Christoph Gmelin (Robert Bosch GmbH); **Uwe Janoske** (University Wuppertal)

12:20 #525: Contact line catch up by growing ice crystals

Christophe Josserand (LadHyX, CNRS & E. Polytechnique); Rodolphe Grivet (LadhyX-Ecole polytechnique); Axel Huerre (MSC-CNRS); Antoine Monier (InPhyNi-CNRS); Thomas Séon (Institut ∂'Alembert, CNRS)

S6 Cavitation/Nucleation 11:00−12:20, April 5, Room 406

Session Chair: **Hiroyuki Takahira (Osaka Metropolitan University)**

11:00 #400: Large-eddy simulation of cavitating flow using both homogeneous fluid model and interface tracking model

Shungo Okamura (Osaka University); Kie Okabayashi (Osaka University)

11:20 #414: Cancelled

11:40 #774: Numerically understanding of chemical kinetics behavior on cavitating orifice flow

Jahidul Haque Chaudhuri (Indian Institute of Technology Madras); Dhiman Chatterjee (Indian Institute of Technology Madras)

12:00 #744: Characteristics of the microjets during shock-induced tandem bubble collapse

Wangxia Wu (Beijing Institute of Technology); Bing Wang (Tsinghua University); Qingquan Liu (Beijing Institute of Technology)

S6 OS: Bubbles and Drops (Bubbles) 11:00−12:40, April 5, Room 501

Session Chair: **Alessio Roccon (University of Udine)**

11:00 #537: Formation of microbubble-encapsulated vesicle by flow-focusing and inverted emulsion

Ryuki Kakukawa (The University of Tokyo); Hiroko Shiozaki (The University of Tokyo); Ryota Kiyozumi (The University of Tokyo); Mitsuhisa Ichiyanagi (Sophia University); Shu Takagi (The University of Tokyo)

11:20 #457: Experimental investigation of the Local mass transfer around a slug bubble in a rectangular column

Lokesh Rohilla (Council of Scientific and Industrial Research-IMMT); Ravi Prakash (Indian Institute of Technology, Roorkee)

11:40 #683: Polarization measurement of flow structure around a moving bubble/solid in a quiescent liquid

Hiroaki Kusuno (Tokyo University of Agriculture and Technology); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

12:00 #795: Toroidal bubbles formation from the orifice of a buoyancy driven pivoting lever

Lang Qin (Tsinghua University); Shuhong Liu (Tsinghua University); Zhigang Zuo (Tsinghua University)

12:20 #566: Ship frictional drag reduction using hydrofoil bubble generators

Yuichi Murai (Hokkaido University); Ichiro Kumagai (Meisei University)

S6 OS: Boiling, Condensation, Evaporation 11:00–12:20, April 5, Room 502

Session Chair: **Shoji Mori (Kyushu University)**

11:00 #41: Two-phase frictional pressure drop at high saturation temperatures in a horizontal micro-scale channel

Daniel Borba Marchetto (University of Sao Paulo); **Rémi Revellin** (INSA Lyon); Romuald Rulliere (University of Sao Paulo); Gherhardt Ribatski (University of Sao Paulo)

11:20 #751: Flow behaviors and void fraction distribution in mini-channel cross-flow vaporizer

Keita Kiyohara (Kobe University); Hideki Murakawa (Kobe University); Katsumi Sugimoto (Kobe University); Yohei Kubo (Kobe Steel, Ltd); Keisuke Kurita (Japan Atomic Energy Agency); Hiroshi Iikura (Japan Atomic Energy Agency); Hitoshi Asano (Kobe University)

11:40 #24: Numerical study of conjugate heat transfer effects on two-phase cooling with multi-microchannels heat sinks

Federico Municchi (Colorado School of Mines); Ismail El Mellas (University of Nottingham); Omar Matar (Imperial College London); **Mirco Magnini** (University of Nottingham)

12:00 #665: R448A evaporation heat transfer coefficient inside multiport mini-channel tubes: experimental study and assessment of correlation

Hieu Ngoc Hoang (Chonnam National University); Nurlaily Agustiarini (Chonnam National University); Jong-Taek Oh (Chonnam National University); Chien Nguyen Ba (Hanoi University of Science and Technology)

S6 Computational Techniques for Multiphase Flows 11:00–12:40, April 5, Room 503

Session Chair: **Takeshi Seta (University of Toyama)**

11:00 #541: A new method for the adaptative removal of stiffness in PDEs

Laurent Duchemin (PMMH / ESPCI); Jens Eggers (University of Bristol)

11:20 #676: Assessing computational modelling of interface dispersion with hybrid multifluid CFD approaches

Daniele Vivaldi (IRSN); Marco Colombo (University of Sheffield)

11:40 #210: Comparison of diffuse and sharp interface methods for highly compressible flows within a unified framework

Nico Fleischmann (Technical University of Munich); Stefan Adami (Technical University of Munich); Nikolaus Adams (Technical University of Munich)

12:00 #315: A mass-conserving pressure-based method for compressible two-phase flows with phase change and wetting effects

Marica Pelanti (ENSTA Paris); Nicolo Scapin (KTH); Luca Brandt (KTH & NTNU); Wai Hong Ronald Chan (University of Colorado); Suhas Jain (Stanford University); Shahab Mirjalili (Stanford University)

12:20 #440: Fast simulation of multiphase compressible flows through GPU acceleration

Henry A Le Berre (Georgia Institute of Technology); Anand Radhakrishnan (Georgia Institute of Technology); **Spencer H Bryngelson** (Georgia Institute of Technology)

S6 Multiphase Flow in Heat and Mass Transfer 11:00−12:40, April 5, Room 504

Session Chair: **Masahiro Kawaji (The City College of New York)**

11:00 #741: Mass transfer at large Peclet number : study of a model three-phase flow.

Stéphane Zaleski (Sorbonne Université); Jacob Maarek (Sorbonne Université); Nelson Joubert (Sorbonne Université); Yash Kulkarni (Sorbonne Université); Stéphane Popinet (Sorbonne Université); Pascal Gardin (Arcelor-Mittal Research)

11:20 #63: Direct numerical simulation of gas-liquid mass transfer around contaminated bubbles

Kalyani Kentheswaran (Université de Toulouse); Nicolas Dietrich (Université de Toulouse); Benjamin Lalanne (University of Toulouse - Toulouse INP)

11:40 #142: Mass transfer measurements of a self-pumping transpiration cooling system

Julian Härter (University of Stuttgart); Christoph Steinhausen (University of Stuttgart); Rico Poser (University of Stuttgart); Grazia Lamanna (University of Stuttgart)

12:00 #597: Liquid-liquid mass transfer in miniature geometries using sudden expansion devices

Pushpender (Indian institute of technology Roorkee); Sumana Ghosh (Indian institute of technology Roorkee)

12:20 #673: Hydrodynamics and mass transfer of two-phase flow extraction of neodymium using ionic liquids in small channels.

Charlotte L Pheasey (UCL); Panaguiota Angeli (UCL)

S6 OS: Bubbles and Drops (Drops) 11:00−12:40, April 5, Room 505

Session Chair: **Minori Shirota (Hirosaki University)**

11:00 #132: What sets the leidenfrost temperature of a drop on a hot solid surface

Yuki Wakata (Tsinghua University); Ning Zhu (Tsinghua University); Xiaoliang Chen (Tsinghua University); Sijia Lyu (Tsinghua University); Detlef Lohse (Physics of Fluids Group, Max-Planck Center Twente for Complex Fluid Dynamics & JM Burgers Center, Department of Science and Technology, University of Twente); Xing Chao (Tsinghua University); Chao Sun (Tsinghua University)

11:20 #759: Evaporation characteristics of leidenfrost droplets on a heated pool

Koji Hasegawa (Kogakuin University); Ryo Matsumoto (Kogakuin University)

11:40 #513: Wetting properties of ice-water systems

Rodolphe Grivet (LadhyX-Ecole polytechnique); Axel Huerre (MSC Université Paris Cité - CNRS); Thomas Séon (Institut ∂'Alembert, CNRS); Christophe Josserand (LadHyX, CNRS & E. Polytechnique)

12:00 #202: How gravity influence droplets freezing on solid surface

Hao Zeng (Tsinghua university); Sijia Lyu (Tsinghua university); Dominique Legendre (IMFT); Chao Sun (Tsinghua university)

12:20 #491: Effect of the ambiant medium on the freezing of a droplet

Sijia Lyu (Tsinghua University); Chao Sun (Tsinghua University); Dominique Legendre (IMFT - Toulouse)

—— Lunch Break (Ariston Hotel Kobe) ——

S7 Particle-Laden Flows 13:50−15:10, April 5, Room 301

Session Chair: **Cristian Marchioli (University of Udine)**

13:50 #692: Inertial particle dynamics in underexpanded jets

Meet Patel (University of Michigan); Juan S Rubio (Johns Hopkins University); Rui Ni (Johns Hopkins University); Jason Rabinovitch (Stevens Institute of Technology); Jesse Capecelatro (University of Michigan)

14:10 #574: Humidity effect on the particle-laden jet with crossflow

Jooyeon Park (Seoul National University); Hyungmin Park (Seoul National University)

14:30 #555: Divergence and rotation of inertial particles in a four-way coupled channel flow

Thibault Oujia (Institut de Mathématiques de Marseille, Aix-Marseille Université, CNRS); Jacob West (Department of Mechanical Engineering, Stanford University); Keigo Matsuda (Japan Agency for Marine-Earth Science and Technology); Kai Schneider (Institut de Mathématiques de Marseille, Aix-Marseille Université, CNRS); Suhas Jain (Center for Turbulence Research, Stanford University); Kazuki Maeda (Center for Turbulence Research, Stanford University,)

14:50 #573: Particle dynamics in the channel flow over two staggered rectangular obstacles

Yeeun Kang (Seoul National University); Hyungmin Park (Seoul National University)

S7 OS: Micro- and Nano-Scale Multiphase Flows 13:50−15:30, April 5, Room 401

Session Chair: **Masahiro Takei (Chiba University)**

13:50 #110: Dynamics of microfluidic systems in complex scenarios: presence of surfactants, interfacial singularities and complex geometries

Paula D Pico (Imperial College London); Lyes Kahouadji (Imperial College London); Assen Batchvarov (Imperial College London); Alessio Lavino (Imperial College London); Seungwon Shin (Hongik University); Jalel Chergui (LISN-CNRS); Damir Juric (LISN-CNRS); Omar Matar (Imperial College London)

14:10 #364: Flows inside surfactant-laden and surfactant-free microfluidic drops: experiments and numerical simulations

Nina M Kovalchuk (University of Birmingham); Lyes Kahouadji (Imperial College London); Paula D Pico (Imperial College London); Omar Matar (Imperial College London); **Mark Simmons** (University of Birmingham)

14:30 #97: Taylor bubble velocity for gas and non-Newtonian liquid two-phase flow in microchannels with T-junction inlet

Akimaro Kawahara (Kumamoto University); Yukihiro Yonemoto (Kumamoto University); Yoichi Arakaki (Kumamoto University)

14:50 #790: Measurement of nanoliter droplets in a microchannel using phase retrieval holography

Dai Nakai (Kyoto Institute of Technology); Yohsuke Tanaka (Kyoto Institute of Technology)

15:10 #445: Fractal analysis of gas-non-Newtonian liquid two-phase flow in microchannels

Haslinda Kusumaningsih (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada); M. Rian Alif Madani (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada); Muhammad Fakhri Alfath (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada); Aldy Franstanata Ritonga (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada); Deendarlianto Deendarlianto (Universitas Gadjah Mada); Indarto Indarto (Department of Mechanical and Industrial Engineering, Universitas Gadjah Mada)

S7 Modelling of Multiphase Flows 13:50−15:30, April 5, Room 402

Session Chair: **Marco Colombo (University of Sheffield)**

13:50 #471: Aeration of large free-falling jet and its impact on solid ground and liquid ponds

Diego Ferrando (Université de Rouen Normandie); Hakim Hamdani (Université de Rouen Normandie); Javier Anez (EDF); Yvan Bercovitz (EDF); Benjamin Duret (Université de Rouen Normandie); Julien Reveillon (Université de Rouen Normandie); **François-Xavier Demoulin** (Université de Rouen Normandie)

14:10 #456: Numerical investigation of the break-up of liquid jets and sheets in a gas media.

Cristina Garcia Llamas (Eindhoven University of Technology); Vivekanand V Swami (Eindhoven University of Technology); Vilena Petrova (Eindhoven University of Technology); Koen Jennekens (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology)

14:30 #532: A multi-scale Eulerian-Lagrangian method based on unstructured AMR for the simulation of atomization

Ibtissam El Yamani (CORIA); Romain Janodet (CORIA); Mélody Cailler (Safran Tech); Renaud Mercier (Safran Tech); Vincent Moureau (CORIA)

14:50 #372: High-fidelity simulation of a pressure swirl fuel atomizer: in-depth analysis of in-nozzle flow dynamics and liquid sheet disintegration

Julien Carmona (CORIA); Julien Leparoux (Safran Tech); Vincent Moureau (CORIA)

15:10 #275: A numerical study of the influence of heated atomization gas on the compressible two-phase flows in a close-coupled atomizer

Alexander Ariyoshi Zerwas (University of São Paulo); Manuel Falcone (John Wood Group PLC); José Luis de Paiva (University of São Paulo); Roberto Guardani (University of São Paulo); Lydia Achelis (University Bremen); Udo Fritsching (University Bremen)

S7 Experimental Methods for Multiphase Flows 13:50−15:30, April 5, Room 403

Session Chair: **Renè Van-Hout (Technion - Israel Institute of Technology)**

13:50 #557: Non-contact measurement of ultrasound pressure field using background-oriented Schlieren technique

Sayaka Ichihara (Tokyo University of Agriculture and Technology); Yuta Kurashina (Tokyo University of Agriculture and Technology); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

14:10 #834: Basic research on integration of ultrasonic level measurement and LIBS elemental analysis for PCV internal detection under mist condition

Yuan Chen (Tokyo institute of technology); Naruki Shoji (Tokyo institute of technology); Zeliang Zhang (Tokyo institute of technology); Tri Vien Tran (Tokyo institute of technology); Hideharu Takahashi (Tokyo Institute of Technology); Hiroshige Kikura (Tokyo institute of technology)

14:30 #501: Eddy current based detection of inclusions in liquid metal flow

Antoine Afflard (CEA Cadarache); R. Zamansky (IMFT); W. Bergez (IMFT); P. Tordjeman (IMFT); K. Paumel (CEA)

14:50 #659: Two-phase flow metering of maldistribution inside a header by mean of Venturi flowmeter solely

Aude Lecardonnel (Von karman Institute); C. Tempesti (Von karman Institute); C. de Servi (Delft University of Technology); P. Colonna (Delft University of Technology); D. Laboureur (Von karman Institute)

15:10 #803: Separation of complex oil-water mixtures with an adapted Pitot pump

Jessica Köpplin (Otto von Guericke University Magdeburg); Dominique Thevenin (Otto von Guericke University Magdeburg)

S7 OS: Fluidization 13:50−15:30, April 5, Room 404

Session Chair: **Toshitsugu Tanaka (Osaka University)**

13:50 #825: Modelling of pseudo-turbulence and fluid turbulence modulation in liquid-solid fluidized bed by using R_{ij}-epsilon SSG turbulence model

Almir GSL Ritta (Institut National Polytechnique de Toulouse); Renaud Ansart (Institut National Polytechnique de Toulouse); Olivier Simonin (Institut National Polytechnique de Toulouse)

14:10 #721: Second and third moments of liquid and solid phase velocity distributions in homogeneously fluidized inertial suspensions

Elise Almeras (IFP Energies nouvelles); **Olivier Masbernat** (Laboratoire de Génie Chimique); Frédéric Risso (Institut de mécanique des Fluides de Toulouse); Rodney O. Fox (Iowa State University)

14:30 #287: Numerical modeling of induction heating fluidized-bed reactor for hydrogen production using methane pyrolysis

Mino Woo (Korea Institute of Industrial Technology); Gyeong-min Kim (Korea Institute of Industrial Technology); Yoon-ho Bae (Pusan National University); Dong-ha Lim (Korea Institute of Industrial Technology)

14:50 #353: A comprehensive assessment of the effect of the collision parameters on the hydrodynamics of a pseudo-2D fluidized bed

Mohsen Zarepour (University of Saskatchewan); Donald J. Bergstrom (University of Saskatchewan); L. Zhang (University of Saskatchewan); Raymond J. Spiteri (University of Saskatchewan)

15:10 #464: On the modeling of the subgrid-scale production of uncorrelated random particle kinetic energy in coarse grid two-fluid model simulations of gas-solid flows

Baptiste Hardy (Institut de Mécanique des Fluides de Toulouse); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT))

S7 Droplet Flows 13:50−15:30, April 5, Room 405

Session Chair: **Uwe Janoske (University Wuppertal)**

13:50 #615: Droplet spatial distribution in a spray

Olivier Rouzaud (Onera); Lola Rousseau (ONERA); Mikaël Orain (ONERA); Pierre Doublet (ONERA); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT))

14:10 #553: Gas-liquid coaxial atomization in a high-pressure environment

Kee Onn Fong (University of Washington); Xinzhi Xue (University of Washington); Rodrigo Osuna-Orozco (University of Washington); **Alberto Aliseda** (University of Washington)

14:30 #587: Influence of liquid properties on atomization and spray characteristics of a slinger atomizer

Arshdeep Singh (Indian Institute of technology, Madras); Srikrishna Sahu (Indian Institute of technology,Madras); Dalton Maurya (GTRE,India)

14:50 #408: Viscous flow through a pressure-swirl nozzle

Vivekanand V Swami (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology)

15:10 #761: A computational fluid dynamics - population balance approach for virus-laden droplets transport under different ventilation conditions

Yi Feng (Politecnico di Torino); Dongyue Li (DYFLUID Ltd); Daniele Marchisio (Politecnico di Torino); Marco Vanni (Politecnico di Torino); Antonio Buffo (Politecnico di Torino)

S7 Turbulence in Multiphase Flows 13:50−15:10, April 5, Room 406

Session Chair: **Eckart Meiburg (University of California at Santa Barbara)**

13:50 #444: Numerical simulation of turbulent multiphase flows with complex geometries

Zhihua Xie (Cardiff University)

14:10 #182: An enstrophy-based analysis of the characteristic length scales in interfacial turbulence

Mahdi Saeedipour (Johannes Kepler University)

14:30 #563: A dual-scale closure for large eddy simulation of phase interfaces in turbulent flows

Dominic Kedelty (Arizona State University); Austin Goodrich (Arizona State University); **Marcus Herrmann** (Arizona State University)

14:50 #716: Direct numerical simulation of turbulent boundary layer flow over a permeable bed using continuum and pore-resolved approaches

Shashank K Karra (Oregon State University); **Sourabh V Apte** (Oregon State University); Xiaoliang He (Pacific Northwest National Laboratory)

S7 Bubbly Flows 13:50−15:10, April 5, Room 501

Session Chair: **Niels Deen (Eindhoven University of Technology)**

13:50 #224: Coarse-grained simulations of the turbulence induced by a bubble swarm

Florian Le Roy de Bonneville (IMFT / CEA); **Rémi Zamansky** (IMFT); Frédéric Risso (CNRS-IMFT); Anne Boulin (CEA); Jean-François Haquet (CEA)

14:10 #631: The passive scalar spectrum of bubble-induced turbulence.

Niklas Hidman (Chalmers University of Technology); Henrik Ström (Chalmers University of Technology); Srdjan Sasic (Chalmers University of Technology); **Gaetano Sardina** (Chalmers University of Technology)

14:30 #816: Bubble-induced turbulence and reattachment length in an upward bubbly pipe flow with sudden expansion

Yewon Kim (Seoul National University); Hyungmin Park (Seoul National University)

14:50 #664: Two-dimensional turbulent bubble raft statistics from a plunging liquid jet

Robert K Keane (University of Massachusetts, Amherst); Aaron Fishbein (University of Massachusetts, Amherst); Utkarsh Jain (University of Massachusetts, Amherst); **Varghese Mathai** (University of Massachusetts, Amherst)

S7 OS: Boiling, Condensation, Evaporation 13:50–15:30, April 5, Room 502

Session Chair: **Shoji Mori (Kyushu University)**

13:50 #412: Critical heat flux and bubble behavior analysis on tube bundles during pool boiling

Bikash Pattanayak (Indian Institute of Technology Jodhpur); Manoj Kothari (Indian Institute of Technology Jodhpur); Hardik Kothadia (Indian Institute of Technology Jodhpur)

14:10 #646: The effect of liquid height on the pool boiling critical heat flux of water at atmospheric pressure

Rodrigo Cavalcanti Alvarez (Massachusetts Institute of Technology); Gustavo Matana Aguiar (Massachusetts Institute of Technology); Matteo Bucci (Massachusetts Institute of Technology)

14:30 #608: Boiling heat transfer characteristics of magnetic nanofluids under magnetic field

Shun Ito (Kobe University); Shuhei Kumano (Kobe University); Hideki Murakawa (Kobe University); Katsumi Sugimoto (Kobe University)

14:50 #709: Vaporization at high reduced pressure induced by very rapid power input

Jean Muller (von Karman Institute (VKI)); **Pierre Ruyer** (IRSN); Romuald Rullière (Univ. Lyon, CNRS, INSA Lyon, CETHIL, UMR5008); Marc Clausse (Univ. Lyon, CNRS, INSA Lyon, CETHIL, UMR5008)

15:10 #653: Application of liquid film sensor using an optical waveguide film to steam-water two-phase flow in a vertical condensation tube

Hajime Furuichi (Hitachi, Ltd); Kosuke Nakano (Shizuoka University); Yujiro Teramoto (Shizuoka University); Yuki Mizushima (Shizuoka University); Toshiyuki Sanada (Shizuoka University)

S7 Computational Techniques for Multiphase Flows 13:50–15:30, April 5, Room 503

Session Chair: **Naoki Takada (National Institute of Advanced Industrial Science and Technology)**

13:50 #20: Multiscale modelling of contact line dynamics using combined finite volume - molecular dynamics simulation

Avik Saha (IIT Roorkee); Arup Kumar Das (IIT Roorkee)

14:10 #524: A Cartesian cut cell method for mixed robin or Navier slip boundary conditions

Alejandro Quirós Rodríguez (Sorbonne Université); Tomas Fullana (Sorbonne University); Vincent Le Chenadec (Gustave Eiffel University); Taraneh Sayadi (Sorbonne University)

14:30 #483: High-resolution simulation of turbulent Taylor bubble flow at low Reynolds number

Edo Frederix (NRG); Jun Fang (ANL); Elia Merzari (PSU); Ed Komen (NRG)

14:50 #394: In silico study of the effect of surfactant on the oil spreading at the interface between water droplets and hydrophobic surfaces

Takeshi Kobayashi (University College London); Teng Dong (University College London); Kristo Kotsi (University College London); Alexander Moriarty (University College London); Ian McRobbie (Innospec Inc.); Alberto Striolo (University College London); Panagiota P Angeli (UCL)

15:10 #40: Simulation of bubble collapse near a curved wall using a penalization method

Lucas Ménez (Pprime-ENSMA); Philippe Parnaudeau (Pprime-ENSMA); Marianne Beringhier (Pprime-ENSMA); Eric Goncalves (ISAE-ENSMA)

S7 Multiphase Flow in Heat and Mass Transfer 13:50−15:30, April 5, Room 504

Session Chair: **Stephane Zaleski (Sorbonne Universite)**

13:50 #331: Investigation of the effects of fluid velocity and liquid properties on the multiphase regimes in horizontal rectangular ducts

Ahmed Abou Sherif (University of Nottingham); Kathy Johnson (University of Nottingham); David Hann (The University of Nottingham)

14:10 #272: Numerical simulation of the dynamics of a multicomponent droplet in water using the phase-field model of TrioCFD code

Mirantsoa Aimé Rasolofomanana (French Alternative Energies and Atomic Energy Commission CEA), Romain Le Tellier (CEA); Herve Henry (Institut Polytechnique de Paris)

14:30 #592: Active control of coffee-ring effect using contact angle hysteresis and magnetic field

Heemin Lee (Yonsei University); Joon Sang Lee (Yonsei University)

14:50 #435: Dendrite growing on a cold substrate

Kuan-Ling Huang (LadHyX); Christophe Josserand (LadHyX); Stephane Popinet (Institut Jean Le Rond d'Alembert); Alexandre Limare (LadHyX)

15:10 #526: Dynamics of lateral hydrate growth and associated interfacial heat transfer processes: backlight visualisation and temperature measurements

Muhammad Kamel (Imperial College London); Aleksei Lobasov (Imperial College London); Suryanarayan Lakshminarayan (Imperial College London); Konstantin S. Pervunin (Imperial College London); **Christos Markides** (Imperial College London)

S7 OS: Bubbles and Drops (Drops) 13:50−15:30, April 5, Room 505

Session Chair: **Dominique Legendre (Institut de Mecanique des Fluides de Toulouse)**

13:50 #496: Effect of curvature distortion and refractive index on flow measurement in a droplet

Eugene Gatete (University of Tsukuba, Systems and Information Engineering, Graduate School of Science and Technology, Degree Program of Engineering Mechanics); Akiko Kaneko (University of Tsukuba); Biao SHEN (University of Tsukuba, Faculty of Engineering of Information Engineering and Systems)

14:10 #620: Temperature field and internal flow in an acoustically levitated droplet under laser heating

Tamaki Aiko (University of Tsukuba); Biao Shen (University of Tsukuba); Koji Hasegawa (Kogakuin University); **Akiko Kaneko** (University of Tsukuba)

14:30 #59: Electrokinetic flow about a drop

Michael R Booty (New Jersey Institute of Technology); Manman Ma (Tongji University); Michael Siegel (New Jersey Institute of Technology)

14:50 #86: Evaluating the concentration of contaminants at the surface of a drop from its shape oscillation dynamics

Benjamin Lalanne (University of Toulouse - Toulouse INP); Olivier Masbernat (CNRS-University of Toulouse); Frédéric Risso (CNRS-IMFT)

15:10 #164: Experimental investigation of the oscillation characteristics of large raindrops

Jongwon Lee (Seoul National University); Wontae Hwang (Seoul National University)

—— Coffee Break ——

S8 Particle-Laden Flows 16:00−17:20, April 5, Room 301

Session Chair: **Yoichi Mito (Kitami Institute of Technology)**

16:00 #183: Numerical simulation of inertial ellipsoidal particles in a vertical gas-solid channel flow with inter-particle and particle-wall coliisions

Karan Anand (Institut de Mécanique des Fluides de Toulouse); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT))

16:20 #351: Effect of non-spherical particle rotation on flow structure and flow resistance coefficients at moderate Reynolds numbers

Santiago Lain (Universidad Autonoma de Occidente); Carlos Castang (Universidad Autonoma de Occidente); Diego Garcia (Universidad Autonoma de Occidente); Martin Sommerfeld (Otto-von-Guericke University Magdeburg)

16:40 #346: Analysis of ellipsoidal particle dynamics in anisotropic turbulent flow

Thede Peter Kiwitt (RWTH Aachen University); Laurent André (RWTH Aachen University); Matthias Meinke (RWTH Aachen University); Wolfgang Schröder (RWTH Aachen University)

17:00 #827: Decoupling turbulence from gravity in a particle-laden turbulent flow

Facundo Cabrera (Portland State University); Karl Cardin (Portland State University); Laurent Chevillard (Phys. Lab - CNRS); Nicolas Plihon (Phys. Lab - CNRS); Mickael Bourgoin (Phys. Lab - CNRS); **Raúl B Cal** (Portland State University)

S8 OS: Micro- and Nano-Scale Multiphase Flows 16:00−17:40, April 5, Room 401

Session Chair: **Akimaro Kawahara (Kumamoto University)**

16:00 #251: On the stability of nanobubbles in bulk

Ayush K Dixit (Indian Institute of Technology, Roorkee); **Arup Das** (Indian Institute of Technology, Roorkee)

16:20 #380: Repeated jetting driven by shape oscillations of microbubbles

Marco Cattaneo (ETH Zurich); Gazendra Shakya (ETH Zurich); Outi Supponen (ETH Zurich)

16:40 #711: Experimental study on the microbubble generation mechanism and effect of nozzle structure

Chang Hun Lee (Pukyong National University); Dong In Yu (Pukyong National University); Su Cheong Park (Pukyong National University); Somchai Wongwises (King Mongkut's University); TaeJoo Kim (Korea Atomic Energy Research Institute); Ho Seon Ahn (Incheon National University)

17:00 #719: Inertial migration of size-controlled double emulsions

Ruri Hidema (Kobe University); Shogo Sasaki (Kobe University); Hiroshi Suzuki (Kobe University)

17:20 #743: Liquid-liquid dispersions within milli-scale symmetric confined impinging jets

Cong Duan (University College London); Haoyu Wang (University College London); Panagiota P Angeli (UCL)

S8 Modelling of Multiphase Flows 16:00−17:40, April 5, Room 402

Session Chair: **Matjaz Hribersek (University of Maribor)**

16:00 #642: A two-scale two-phase flow model with capillarity and small-scale reduced-order model based on a geometric method of moments

Arthur Loison (CMAP, École polytechnique); Samuel Kokh (CEA); Teddy Pichard (CMAP, École polytechnique); Marc Massot (CMAP, Ecole Polytechnique)

16:20 #845: Development of numerical prediction method for bubble coalescence phenomenon under the mercury flows

Gen Ariyoshi (Japan Atomic Energy Agency); Kei Ito (Kyoto University); Hiroyuki Kogawa (Japan Atomic Energy Agency); Masatoshi Futakawa (Japan Atomic Energy Agency)

16:40 #862: Swirling gas-liquid vertical pipe flow: a mechanistic modelling framework

Matheus M. Garcia (Delft University of Technology); Dion Ammerlaan (Delft University of Technology); Bart van der Zalm (Delft University of Technology); **Luis Portela** (Delft University of Technology)

17:00 #149: On the simulation of two-phase cross-flow in a tube bundle guided by experimental forces spectra

Clément Bazin (CEA); Maria-Giovanna Rodio (CEA); Romain Lagrange (CEA); Christophe Josserand (LadHyX, CNRS & E. Polytechnique)

17:20 #405: Explainable AI for multifluid flow: how does a trained convolutional neural network interpret droplet coalescence in diamond-shaped microchannel?

Masahiro Furuya (Waseda University); Tomoya Murashige (Waseda University); Hirotaka Tanaka (Waseda University); Kohei Yamanaka (Waseda University); Manabu Asahi (Waseda University); Daiki Tanaka (Waseda University); Tetsushi Sekiguchi (Waseda University); Shuichi Shoji (Waseda University)

S8 Experimental Methods for Multiphase Flows 16:00−17:40, April 5, Room 403

Session Chair: **Renè Van-Hout (Technion - Israel Institute of Technology)**

16:00 #365: Experimental investigation of the relative viscosity for different emulsion systems in a pipeline flow

Natan A. V. Bulgarelli (Center for Energy and Petroleum Studies - University of Campinas); William Monte Verde (Center for Petroleum Studies); Jorge Luiz Biazussi (University of Campinas); Marcelo S Castro (UNICAMP)

16:20 #696: Investigation of particle laden gravity currents using the light attenuation technique

Yvan Dossmann (Université de Lorraine); Jean Schneider (Université de Lorraine); Sébastien Kiesgen de Richter (Université de Lorraine); Olivier Farges (Université de Lorraine)

16:40 #763: Charge neutralizing effect of aluminium stearate in triboelectrification by aerodynamic dispersion

Jiachen Guo (University of Leeds, Nanjing University of Aeronautics); **James R Middleton** (University of Leeds); Wei Pin Goh (University of Leeds); Xiaodong Jia (University of Leeds); Andrew Scott (University of Leeds); Mojtaba Ghadiri (University of Leeds)

17:00 #842: Development and test of unmaned aerial vehicle for measuring atmospheric particle flow based on multi-resolution holographic imaging and full-scale sonic anemometer

Xiaofei Zhang (Guangdong Technion-Israel Institute of Technology); Biaosheng Luo (Guangdong Technion-Israel Institute of Technology); Yixun Liu (Guangdong Technion-Israel Institute of Technology); Hongtao Qian (Guangdong Technion-Israel Institute of Technology); Cheng Li (Guangdong Technion- Israel Institute of Technology)

17:20 #259: Chemical destabilization of emulsions in a direct contact heat storage column

Halvard Thon (SINTEF AS); Galina Simonsen (SINTEF AS); Paul Roger Leinan (SINTEF AS)

S8 OS: Fluidization 16:00–17:40, April 5, Room 404

Session Chair: **Olivier Simonin (Institut de Mecanique des Fluides de Toulouse)**

16:00 #205: An experimental study of slug behavior in 2D gas-solid tapered fluidized beds

Lipak Sahoo (Indian Institute of Technology Madras); **Sabita Sarkar** (Indian Institute of Technology Madras)

16:20 #713: Cylindrical particles behavior in a liquid/solid fluidized bed

Kamel Landal Otmani (IFP Energies nouvelles); **Rim Brahem** (IFP Energies nouvelles); Elise Almeras (IFP Energies nouvelles)

16:40 #269: Prediction of high temperature minimum fluidization of cohesive metallic particles

Conrad Hessels (Eindhoven University of Technology); Giulia Finotello (Eindhoven University of Technology); Yali Tang (Eindhoven University of Technology); Tess Homan (Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology)

17:00 #591: Mixing/segregation behaviors for density difference of binary particles in a vibro-fluidized bed

Yoshihide Mawatari (Kyushu Institute of Technology); Naoki Iwamura (Kyushu Institute of Technology)

17:20 #626: Evaluation of attrition and fragmentation tendency of limestone-based sorbents for sorption-enhanced gasification in dual interconnected fluidized bed reactors

Antonio Coppola (STEMS-CNR); **Fabio Montagnaro** (University Federico II of Naples); Fabrizio Scala (University Federico II of Naples)

S8 Droplet Flows 16:00–17:40, April 5, Room 405

Session Chair: **Alberto Aliseda (University of Washington)**

16:00 #96: Global and Local statistics in turbulent emulsions

Chao Sun (Tsinghua University); Lei Yi (Tsinghua University); Federico Toschi (Eindhoven University of Technology)

16:20 #540: Long-time dynamics of water-in-oil emulsions in an annular planar Couette flow

Rémi Macadré (LGC-IMFT); Olivier Masbernat (Laboratoire du Génie Chimique (LGC)); Frédéric Risso (CNRS-IMFT); Roel Belt (TotalEnergies)

16:40 #458: The effect of aerodynamic interactions on the coalescence of cloud droplets

Antoine Michel (Institute of Meteorology and Water Management); Ahmad Ababaei (Institute of Meteorology and Water Management – National Research Institute); **Bogdan Rosa** (Institute of Meteorology and Water Management – National Research Institute)

17:00 #273: On the phenomenology of pairwise interactions in a buoyancy driven flow.

Nicolas N Fintzi (IFPEN); Jean-Lou Pierson (IFPEN); Stéphane Popinet (CNRS & Sorbonne Universite)

17:20 #185: Pipe flow experiments with oil-water dispersions: effect of natural surfactant on flow behavior

Diana C Gonzalez (NTNU); Jørn Kjølaas (SINTEF); Heiner Schumann (SINTEF)

S8 Turbulence in Multiphase Flows 16:00−17:40, April 5, Room 406

Session Chair: **Yuichi Murai (Hokkaido University)**

16:00 #191: Dispersion, collision, and coalescence of bubbles in turbulence

Rui Ni (Johns Hopkins University); Shiyong Tan (Johns Hopkins University)

16:20 #274: An experimental study of particle pair dispersion in bubble-induced turbulence

Tian Ma (Helmholtz-Zentrum Dresden - Rossendorf); Hendrik Hessenkemper (Helmholtz-Zentrum Dresden-Rossendorf); Anna Sommer (Helmholtz-Zentrum Dresden - Rossendorf); Kerstin Eckert (Helmholtz-Zentrum Dresden - Rossendorf); Shiyong Tan (Johns Hopkins University); Rui Ni (Johns Hopkins University); Andrew Bragg (Duke University)

16:40 #333: The near-wall and deposition dynamics of inertial particles in fully developed turbulent channel flow

Miguel X Diaz-Lopez (Johns Hopkins University); Matthew T Gorman (Johns Hopkins University); Rui Ni (Johns Hopkins University)

17:00 #357: Flocculation of suspended cohesive particles in homogeneous isotropic turbulence

Eckart Meiburg (UC Santa Barbara); Kunpeng Zhao (UCSB, Xi'an Jiaotong University); Bernhard Vowinckel (TU Braunschweig); Tom Hsu (U of Delaware); Bofeng Bai (Xi'an Jiaotong University)

17:20 #391: Simulation and modeling of turbulence induced by shock–particle interactions

Archana Sridhar (University of Michigan); Jesse Capecelatro (University of Michigan)

S8 Bubbly Flows 16:00−17:40, April 5, Room 501

Session Chair: **Akiko Kaneko (University of Tsukuba)**

16:00 #791: Three-dimensional measurement of bubbly flow induced by a free-fall impinging jet

Jinho Oh (Pusan National University); Michael Chukwuemeka Ekwonu (Pusan National University); Hyunduk Seo (Pusan National University); Kyung Chun Kim (Pusan National University)

16:20 #552: Free-surface-entrained bubbly flow inside an unbaffled stirred tank

Hyungyu Sung (Seoul National University); Hyungmin Park (Seoul National University)

16:40 #268: Euler-Euler simulation of multiphase submerged jets

Vikrant Vinayak Msc. Kamble (Helmholtz-Zentrum Dresden-Rossendorf / Dresden University of Technology); Roland Rzehak (Helmholtz-Zentrum Dresden-Rossendorf)

17:00 #438: A stochastic computational method for bubbly flows with first steps towards representing inception

Anand Radhakrishnan (Georgia Institute of Technology); Henry A Le Berre (Georgia Institute of Technology); Spencer H Bryngelson (Georgia Institute of Technology); Jose Rodolfo Chriem (California Institute of Technology); Tim Colonius (Caltech)

17:20 #583: A numerical investigation on the horizontal clustering of rising air bubbles

Ingu Lee (Seoul National University); Haecheon Choi (Seoul National University)

S8 OS: Boiling, Condensation, Evaporation 16:00−17:20, April 5, Room 502

Session Chair: **Rémi Revellin (INSA-Lyon)**

16:00 #240: Liquid nitrogen quenching of copper surface with porous structure

Yutaro Umehara (Kyushu University); Rintaro Sadaishi (Kyushu University); Shoji Mori (Kyushu University)

16:20 #769: Effect of oscillation on the performance of a pulsating heat pipe (PHP)

Lakshmanan Swaminathan (Indian Institute of Technology Madras); **Shyama Prasad Das** (Indian Institute of Technology Madras)

16:40 #852: Flow boiling of R1336mzz(Z) in a copper microgap with tapered manifold

Debora C Moreira (EESC/USP); Valter Nascimento Jr (EESC/USP); Satish G Kandlikar (Rochester Institute of Technology); **Gherhardt Ribatski** (USP)

17:00 #805: Cancelled

S8 Computational Techniques for Multiphase Flows 16:00−18:00, April 5, Room 503

Session Chair: **Adam Donaldson (Dalhousie University)**

16:00 #167: Lattice Boltzmann method for multiphase flows with two-relaxation time collision operator

Takeshi Seta (University of Toyama); Keiichi Yamamoto (Nippon Pillar Packing)

16:20 #54: A numerical strategy based on a diffuse interface two-fluid model to simulate the melting of a solid swept by a hot gas flow

Lucas Tallois (CEA); Simon Peluchon (CEA); Philippe Villedieu (ONERA, DMPE)

16:40 #859: Simulation of polydisperse oscillating droplets through high order numerical methods for geometric moment equations

Katia Ait-Ameur (Ecole Polytechnique); Arthur Loison (CMAP, École polytechnique); Samuel Kokh (CEA); Teddy Pichard (CMAP, Ecole Polytechnique); Marc Massot (CMAP, Ecole Polytechnique)

17:00 #363: A lattice Boltzmann flux solver with log-conformation representation and its application to capsule deformation in viscoelastic flow

Hua Zhang (National University of Singapore, Southern University of Science and Technology); Chang Shu (National University of Singapore); Lian-Ping Wang (Southern University of Science and Technology)

17:20 #450: Phase-field lattice-Boltzmann simulation of micro droplet motion on solid surface

Naoki Takada (National Institute of Advanced Industrial Science and Technology); Tomohiro Takaki (Kyoto Institute of Technology); Shintaro Aihara (Kyoto Institute of Technology); Katsuo Mogi (Tokyo Denki University); Satoshi Someya (National Institute of Advanced Industrial Science and Technology); Soumei Baba (National Institute of Advanced Industrial Science and Technology); Shimpei Saito (AIST)

17:40 #616: Homogeneous and heterogeneous transport in porous media with microstructural reactive gradients

Dario Maggiolo (Chalmers University of Technology); Oskar Modin (Chalmers University of Technology); Angela Kalagasidis (Chalmers University of Technology)

S8 Multiphase Flow in Heat and Mass Transfer 16:00−18:00, April 5, Room 504

Session Chair: **Stephane Zaleski (Sorbonne Universite)**

16:00 #341: Evaluation of bubble liftoff correlations for forced convective subcooled boiling at pressures of 1-10 bar

Randy D Samaroo (City College of New York); **Masahiro Kawaji** (City College of New York)

16:20 #590: Recent studies of dry and wet spreading of corium simulant melt at KTH

Maneesh Punetha (KTH Royal Institute of Technology); Lu Zhao (KTH Royal Institute of Technology); Andrei Komlev (KTH Royal Institute of Technology); Alexander Konovalenko (KTH Royal Institute of Technology); Weimin Ma (KTH Royal Institute of Technology); Sevostian Bechta (KTH Royal Institute of Technology)

16:40 #50: Experimental investigations on rod bundle cooling by a water spray in spent fuel pool accident conditions

Guillaume Brillant (IRSN)

17:00 #657: Numerical simulation of droplets impacting onto hot metal surfaces with VoF method and phase change

Kaissar O Nabbout (Otto-von-Guericke-University Magdeburg); Martin Sommerfeld (Otto-von-Guericke University Magdeburg)

17:20 #787: Experimental and numerical thermal-hydraulics study of a steam-droplets flow in a Venturi-type vertical tube with flow deviation - application to LOCA in pwr reactor

Juan Esteban Luna Valencia (IRSN); Arthur V S Oliveira (USP); Alexandre Labergue (Université de Lorraine); Tony Glantz (IRSN); **Michel Gradeck** (Université de Lorraine)

17:40 #312: On the flow field and heat transfer characteristics of a supercritical co2-cooled micro heatsink under high heat flux conditions

Farzad Pourfattah (Southern University of Science and Technology); Lian-Ping Wang (Southern University of Science and Technology); Wei-Mon Yan (National Taipei University of Technology)

S8 OS: Bubbles and Drops (Drops) 16:00−17:40, April 5, Room 505

Session Chair: **Minori Shirota (Hirosaki University)**

16:00 #387: Role of solid particles in tuning microfluidic transition regimes for droplet generation

Loïc Chagot (University College London (UCL)); Simona Migliozzi (University College London); Panagiota P Angeli (UCL)

16:20 #499: Tuning the dripping-to-jetting transition with soft colloids in flow-focusing microchannels

Simona Migliozzi (University College London); Loïc Chagot (University College London (UCL)); Panagiota P Angeli (UCL)

16:40 #478: Effect of wettability on droplet formation in capillary needle

Ravi Prakash (iit roorkee); Sumana Ghosh (Indian institute of technology Roorkee)

17:00 #453: CaCl2-Directed cross-linking and deposition patterns of evaporating sodium alginate sessile droplets

Maedeh Saberi; Ghazal Biglari; Jafar Farhadi; **Vahid Bazargan** (University of Brighton); Marco Marengo (University of Brighton)

17:20 #700: The role of weber and Reynolds number in the dynamics of a bouncing drop

Praveen k Sharma (The LNMIIT jaipur); **Harish N Dixit** (IIT Hyderabad)

Banquet 19:00−21:00 OWADA, Portopia Hotel

Thursday, April 6, 2023

(Plenary Lecture) **Frédéric Risso (Institut de Mécanique des Fluides de Toulouse)** On the Fluctuations Generated by a Dispersed Phase, 9:00−9:50, Main Hall, Chairperson: Tim Colonius (Caltech)

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(Keynote Lecture) **Jochen Fröhlich (Technische Universität Dresden)** Simulation of Particle-laden Flows in Microfluidic Channels, 10:00−10:40, Main Hall, Chairperson: Yasushi Saito (Kyoto University)

(Keynote Lecture) **Kosuke Hayashi (Kobe University)** Lift Correlations of Ellipsoidal Bubbles in Low and High Viscosity Liquids, 10:00−10:40, Room 301, Chairperson: Oscar Mauricio Hernandez Rodriguez (University of São Paulo)

—— Coffee Break ——

S9 Particle-Laden Flows 11:00−12:20, April 6, Room 301

Session Chair: **Ellen Longmire (University of Minnesota)**

11:00 #103: The effect of inertia and distribution of particles in turbulent fluid flow

Yoichi Mito (Kitami Institute of Technology)

11:20 #175: A new DNS-DEM model for the tribocharging of rough particles of the same material in turbulent channel flows

Simon Jantac (PTB); Holger Grosshans (PTB)

11:40 #188: Development of behavioural modification techniques through direct numerical simulation of agglomerating particle-laden turbulent pipe flows

Bisrat Wolde (University of Leeds); Lee F Mortimer (University of Leeds); Michael Fairweather (University of Leeds)

12:00 #459: Analysis of turbulent pipe flow laden with low-inertia particles using the resolvent framework

Rasmus K Schlander (Imperial College London); Stelios Rigopoulos (Imperial College London); George Papadakis (Imperial College London)

S9 OS: Micro- and Nano-Scale Multiphase Flows 11:00−12:20, April 6, Room 401

Session Chair: **Masahiro Kawaji (The City College of New York)**

11:00 #267: Direct numerical simulation of single vapor bubble growth in nucleate pool boiling

Nima Samkhaniani (Karlsruhe institute of technology); Alexander Stroh (Institute of Fluid Mechanics, Karlsruhe Institute of Technology)

11:20 #788: Two-phase flow characteristics in a polymer pulsating heat pipe with HFE working fluid at horizontal orientation

Zhengyuan Pei (Kumamoto University); Nobuhito Nagasato (Kumamoto University); Yasushi KOITO (Kumamoto university)

11:40 #851: Bubble dynamics and heat transfer in microchannel flow boiling: detailed study on bubble dynamics under controlled bubbly flow conditions

Pedro Pontes (IST); Iva Goncalves (IST); Vincente Andrade (IST); Antonio Moreira (IST); Ana Moita (CINAMIL)

12:00 #406: Precipitation reaction flows in microscale geometries

Georgios Stergiou (Helmholtz-Zentrum Dresden-Rossendorf); Kerstin Eckert (Helmholtz-Zentrum Dresden-Rossendorf); Karin Schwarzenberger (Helmholtz-Zentrum Dresden-Rossendorf)

S9 Modelling of Multiphase Flows 11:00−12:20, April 6, Room 402

Session Chair: **Daegyoum Kim (KAIST)**

11:00 #324: Derivation of drag and lift forces and torques experienced by non-spherical particles in wall-bounded linear shear flow

Victor Chéron (Otto-von-Guericke Universität); Manuel A Taborda (Otto von Guericke University Magdeburg); Martin Sommerfeld (Otto-von-Guericke University Magdeburg); Berend van Wachem (University of Magdeburg)

11:20 #542: Oscillations of a micro bubble under a free interface

Gautier Dussuyer (IMFT/Poietis); Antonio Iazzolino (Poietis); Dominique Legendre (IMFT)

11:40 #344: Effect of droplet injection in the hydrodynamic of a riser system

Juan G Ramirez (Eindhoven University of Technology); Levi Peene (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology); Kay Buist (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

12:00 #786: Derivation of fully closed two-phase models of Baer-and-Nunziato type

Vincent Perrier (INRIA)

S9 Experimental Methods for Multiphase Flows 11:00−12:20, April 6, Room 403

Session Chair: **Paolo di Marco (University of Pisa)**

11:00 #782: Investigation of transcritical fluid injections using polarized mie scattering in structured illumination

Valerie Gerber (Institute of Aerospace Thermodynamics); Christoph Steinhausen (Institute of Aerospace Thermodynamics); Bernhard Weigand (Institute of Aerospace Thermodynamics); Grazia Lamanna (Institute of Aerospace Thermodynamics)

11:20 #146: Measurement of interfacial velocity along the surface of a liquid jet in gas crossflow during primary breakup

Tianyi Wang (Imperial College London); Yannis Hardalupas (Imperial College London)

11:40 #284: Investigation of the atomization mechanism in internal-mixing Y-jet nozzles using steam as the dispersing medium

Matheus Rover Barbieri (Universität Bremen); Lydia Achelis (Universität Bremen); Udo Fritsching (University Bremen)

12:00 #674: Spray characterization using shadowgraphy for spray nozzles

Avadhesh Kumar Sharma (The University of Tokyo); Erdal Ozdemir (The University of Tokyo); Ruicong Xu (The University of Tokyo); Shuichiro Miwa (The University of Tokyo); Shunichi Suzuki (The University of Tokyo); Marco Pellegrini (The University of Tokyo)

S9 Colloidal and Suspension Dynamics 11:00−12:20, April 6, Room 404

Session Chair: **Toru Ishigami (Hiroshima University)**

11:00 #219: Can ion adsorption stabilize bulk nanobubbles

Mingbo Li (Tsinghua University); Xiaotong Ma (Tsinghua University); Chao Sun (Tsinghua University)

11:20 #325: Complex viscosity of dilute bubble suspensions in unsteady shear flows

Kohei Ohie (Hokkaido University); Yuji Tasaka (Hokkaido University); Yuichi Murai (Hokkaido University)

11:40 #83: Direct numerical simulations of Quincke rollers with fully resolved hydrodynamics

Shun Imamura (Kyoto UNiversity); Takuya Kobayashi (Kyoto UNiversity); John J. Molina (Kyoto UNiversity); **Ryoichi Yamamoto** (Kyoto UNiversity)

12:00 #271: Simulation of collision events in flotation under the influence of gravity

Benedikt Tiedemann (TU Dresden); Jochen Fröhlich (TU Dresden)

S9 Fluid-Structure Interactions 11:00 – 12:20, April 6, Room 405

Session Chair: **Catherine Colin (Institut de Mecanique des Fluides de Toulouse)**

11:00 #366: Dynamic response of a model of DHSV subjected to two-phase flow

Luis F Acuña-Alegría (Universidade de São Paulo (USP)); Luis Ortiz-Vidal (Universidad de O'higgins (UOH)); Oscar Rodriguez (USP)

11:20 #482: Experimental analysis of the point absorber wave energy convertor (PA-WEC)

Shivam Gupta (Indian institute of technology Roorkee); **Sumana Ghosh** (Indian institute of technology Roorkee); Parmod Vaishnav (ONGC Energy Centre); Priti Sarkar (ONGC Energy Centre); Deepak Kumar (ONGC Energy Centre); Bharat Sitaram Mendhe (ONGC Energy Centre)

11:40 #55: Computational performance of fully submerged wave energy converter

Ranjana Rathaur (Indian Institute of Technology); Patrick Verdin (CRANFIELD UNIVERSITY); Sumana Ghosh (Indian Institute of Technology Roorkee)

12:00 #624: Computation of ship motion in waves, using Cartesian cut-cells

Elena-Roxana Popescu (SINTEF); **Alexandre Morin** (SINTEF); Son Tung Dang (Viettel High Technology Industries Corporation); Stein Tore Johansen (SINTEF)

S9 Turbulence in Multiphase Flows 11:00 – 12:20, April 6, Room 406

Session Chair: **Eckart Meiburg (University of California at Santa Barbara)**

11:00 #80: Dynamic behaviour of flexible filaments canopies in turbulent flows

Giulio Foggi Rota (Okinawa Institute of Science and Technology (OIST)); Alessandro Monti (Okinawa Institute of Science and Technology (OIST)); Stefano Olivieri (Okinawa Institute of Science and Technology (OIST)); Marco Edoardo Rosti (Okinawa Institute of Science and Technology)

11:20 #73: Simulations of viscoelastic turbulent jets at high Reynolds and Weissenberg numbers

Marco Edoardo Rosti (Okinawa Institute of Science and Technology); Giovanni Soligo (Okinawa Institute of Science and Technology Graduate University)

11:40 #23: Air entrainment by plunging turbulent jets: impact of jet roughness revisited.

Ivan Redor (UGA, CNRS, Grenoble-INP / LEGI); Gregory Guyot (EdF Renewable Energy); Martin Obligado (LEGI-UGA); Jean-Philippe Matas (Univ. Lyon); **Alain H Cartellier** (UGA, CNRS, Grenoble-INP / LEGI)

12:00 #61: Large-scale instabilities in two-fluid coaxial atomization with gas swirl

Nathanael Machicoane (CNRS - LEGI); Oliver Tolfts (UGA - LEGI); Alexander Rack (ESRF)

S9 Bubbly Flows 11:00−12:20, April 6, Room 501

Session Chair: **Niels Deen (Eindhoven University of Technology)**

11:00 #27: Buoyancy driven bubbly flows: meso-scale structures and relative motion

Yann Mezui (LEGI-UGA); **Martin Obligado** (LEGI-UGA); Alain H Cartellier (UGA, CNRS, Grenoble-INP / LEGI)

11:20 #873: Bubbly flows in a column with submerged hollow fiber membranes

Ryo Kurimoto (Kobe University); Shin Takaya (Kobe University); Kosuke Hayashi (Kobe University); Akio Tomiyama (Kobe University)

11:40 #503: Gas-liquid gravity-driven exchange flow

Cyril Vettorello (Institut de Mécanique des Fluides de Toulouse); Olivier Praud (IMFT); Véronique Roig (IMFT)

12:00 #500: Study on observation of flow states by ultrasonic measurement for upward gas-liquid multiphase flow in a pipe

Ryota Obana (The University of Tokyo); Kohei Maehara (The University of Tokyo); Kazuya Shimizu (The University of Tokyo); Shu Takagi (The University of Tokyo)

S9 OS: Boiling, Condensation, Evaporation 11:00−12:20, April 6, Room 502

Session Chair: **Rémi Revellin (INSA-Lyon)**

11:00 #339: Drop-wise condensation for deterministic micro/nano surface patterning

Francis Dent (Univeristy of Leeds); **Sepideh Khodaparast** (University of Leeds)

11:20 #783: CHF enhancement on micro/nano hybrid structure under acoustic actuation

Donghwi Lee (Jeonbuk National University); Namkyu Lee (Forschungszentrum Jülich GmbH); Hsu Wei-Ting (Yonsei University); Dong Il Shim (Yonsei University); Maroosol Yun (Yonsei University); Hyung Hee Cho (Yonsei University)

11:40 #204: CHF enhancement by wickability of micro-pillar structured surfaces

Hyeon Taek Nam (Jeonbuk National University); Donghwi Lee (Jeonbuk National University); Seungro Lee (Jeonbuk National University)

12:00 #538: Experimental insights of the enhancement of the liquid heat transfer during nucleate boiling

Gustavo Matana Aguiar (Massachusetts Institute of Technology); Bren Phillips (Massachusetts Institute of Technology); Matteo Bucci (Massachusetts Institute of Technology)

S9 Computational Techniques for Multiphase Flows 11:00−12:20, April 6, Room 503

Session Chair: **Panagiota Angeli (University College of London)**

11:00 #30: Automatic mesh refinement with the N-Euler multiphase solver neptune_cfd to identify software and hardware limitations for industrial fluidized bed simulations at Exascale

Herve Neau (IMFT / CNRS); Maxime Pigou (IMFT / CNRS); Nicolas Renon (UMS CALMIP); Cyril Baudry (EDF); yvan Fournier (EDF); Nicolas Merigoux (EDF); Renaud Ansart (LGC, Toulouse INP); Olivier Simonin (IMFT, Toulouse INP)

11:20 #854: A new strategy for direct numerical simulations with fully resolved particles based on volume-filtering

Mohamed Houssem Kasbaoui (Arizona State University); Marcus Herrmann (Arizona State University)

11:40 #619: NURBS-based immersed boundary method for arbitrarily shaped particles

Lorenzo Vallisa (von Karman Institute for Fluid Dynamics); Maria Teresa Scelzo (von Karman Institute for Fluid Dynamics); Silvania Lopes (von Karman Institute for Fluid Dynamics); Michel De Paepe (Ghent University); Delphine Laboureur (von Karman Institute for Fluid Dynamics)

12:00 #388: Investigating the effects of spurious force oscillations on the motion of finite size particles modelled using the immersed boundary method

Mohammad Giahi (University of Saskatchewan); Donald Bergstrom (University of Saskatchewan)

S9 Multiphase Flow in Heat and Mass Transfer 11:00−12:20, April 6, Room 504

Session Chair: **Mirco Magnini (University of Nottingham)**

11:00 #108: A dynamic of chocolate fountain: multi-physics, multi-phase, and multi-scale modeling

Lyes Kahouadji (Imperial College London); Seungwon Shin (Hongik University); Jalel Chergui (LISN-CRNS); Damir Juric (LISN-CNRS); Omar Matar (Imperial College London)

11:20 #420: FIMF: a filtered-interface multi-fluid approach coupled with the conservative level set method for LES of two-phase heat transfer

François Pecquery (CNRS); Vincent Moureau (CNRS); Mélody Cailler (SAFRAN); Cindy Merlin (ArianeGroup)

11:40 #528: Modeling of conjugate heat transfer in two-phase flows with large-eddy simulation

Cindy Merlin (ArianeGroup); Melody Cailler (SafranGroup); François Pecquery (CNRS); **Vincent Moureau** (CNRS)

12:00 #35: Phase transition modelling for cavitation applications

Eric Goncalves (ISAE-ENSMA); Damien Colombet (Université Grenoble-Alpes)

S9 OS: Bubbles and Drops (Drops) 11:00−12:20, April 6, Room 505

Session Chair: **Shuichiro Miwa (The University of Tokyo)**

11:00 #320: Numerical investigation of the mechanism of early crown formation during an oblique droplet impact onto a wall film

Jonathan Stober (Institute of Aerospace Thermodynamics, University of Stuttgart); Kathrin Schulte (Institute of Aerospace Thermodynamics, University of Stuttgart)

11:20 #360: Computational investigation of compressibility effects in high-speed droplet impact

Erin M Burrell (University of Michigan); William White (University of Michigan); Eric Johnsen (University of Michigan)

11:40 #431: Water droplet impact on thin oil film and bubble entrapment: three phases simulation

Pierre-Antoine Maes (LadHyx); Christophe Josserand (LadHyX, CNRS & E. Polytechnique); Alidad Amirfazli (University of York)

12:00 #571: Prediction of deformation of a drop during an impact on a solid surface using an encoder-decoder

Jingzu Yee (Tokyo University of Agriculture and Technology); Daichi Igarashi (Tokyo University of Agriculture and Technology); Shun Miyatake (Tokyo University of Agriculture and Technology); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

—— Lunch Break (Ariston Hotel Kobe) ——

(Keynote Lecture) **Marco da Silva (Johannes Kepler University Linz)** Multi-dimensional Electrical Impedance Sensors for Multiphase Flow Investigation, 13:30−14:10, Main Hall, Chairperson: Masahiro Takei (Chiba University)

(Keynote Lecture) **Shuichiro Miwa (The University of Tokyo)** The Role of Nuclear Thermal-hydraulics towards Carbon Neutrality: from Drift-flux Model to Deep Learning, 13:30−14:10, Room 301, Chairperson: Roberto Zenit (Brown University)

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S10 Particle-Laden Flows 14:20−15:40, April 6, Room 301

Session Chair: **Alfredo Soldati (TU Wien)**

14:20 #95: How do the finite-sized particles modify the drag in Taylor-Couette turbulent flow

Cheng Wang (Tsinghua University); **Lei Yi** (Tsinghua University); Linfeng Jiang (Tsinghua University); Chao Sun (Tsinghua University)

14:40 #196: Thin disks settling in quiescent and turbulent air

Amy L Tinklenberg (University of Minnesota); Michele Guala (University of Minnesota, Twin Cities); Filippo Coletti (ETH Zurich)

15:00 #446: Settling velocity of inertial particles in turbulent flows. HIT and turbulent/non-turbulent interfaces.

Amelie Ferran (University of Washington); Kee Onn Fong (university of Washington); Martin Obligado (LEGI-UGA); Alberto Aliseda (University of Washington)

15:20 #841: Settling of spherical particles in an upward flow configuration in the dilute regime

Manuel Moriche Guerrero (Karlsruhe Institute of Technology); Markus Uhlmann (Karlsruhe Institute of Technology)

S10 OS: Micro- and Nano-Scale Multiphase Flows 14:20−15:40, April 6, Room 401

Session Chair: **Mirco Magnini (University of Nottingham)**

14:20 #263: The effect of contact-angle hysteresis on droplets jumping from superhydrophobic surfaces - a numerical study

Konstantinos Konstantinidis (Chalmers University of Technology); Johan Göhl (Fraunhofer-Chalmers Centre); Andreas Mark (Fraunhofer-Chalmers Centre); Srdjan Sasic (Chalmers University of Technology)

14:40 #507: Microscopic liquid-gas interface effect on liquid wetting

Jinming Zhang (HZDR); **Wei Ding** (HZDR); Uwe Hampel (HZDR)

15:00 #253: Liquid film thickness measurement in vertical annular flow changing the gas density and surface tension of working fluid

Huacheng Zhang (Kyushu University); Shoji Mori (Kyushu University); Hisano Tutomo (Kyushu University); Hiroyuki YOSHIDA (JAEA)

15:20 #853: Dynamics of plasma proteins in high shear

Frida Nilsson (Royal Institute of Technology); Benedikt Sochor (DESY); Mu-Rong Wang (Royal Institute of Technology); Tomas Rosén (Royal Institute of Technology); Stephan V. Roth (DESY); Daniel Söderberg (Royal Institute of Technology); Mikael Broman (Karolinska University Hospital); Lisa Prahl Wittberg (Royal Institute of Technology)

S10 Modelling of Multiphase Flows 14:20−15:40, April 6, Room 402

Session Chair: **Dimitrios Papavassiliou (University of Oklahoma)**

14:20 #129: Experimental and numerical investigation of a multiphase flow in a rectangular channel at moderate Mach numbers

Benedikt Faraji-Tajrishi (University of Stuttgart Insitute of Aerospace Thermodynamics); Philipp Wellinger (University of Stuttgart Insitute of Aerospace Thermodynamics); Marwan Khaled (University of Stuttgart Insitute of Aerospace Thermodynamics); Marius Forster (University of Stuttgart Insitute of Aerospace Thermodynamics); Bernhard Weigand (University of Stuttgart Insitute of Aerospace Thermodynamics)

14:40 #260: Surface waves of high Reynolds-number film flow over a rotating disk

Dong Ju Kim (KAIST); Daegyoum Kim (KAIST)

15:00 #234: Experimental studies on velocities of gas- and solid-phases in gas–liquid–solid three-phase flow for subsea resource productions

Satoru Takano (National Maritime Research Institute); Sotaro Masanobu (National Maritime Research Institute); Shigeo Kanada (National Maritime Research Institute); Masao Ono (National Maritime Research Institute)

15:20 #137: Hydrodynamics of gas-liquid flow in jumpers of subsea gas production systems

Alexander Yurishchev (Tel Aviv University); Benny Ravid (Tel Aviv University); Amos Ullmann (Tel Aviv University); Neima Brauner (Tel-Aviv University)

S10 Reactive Multiphase Flows 14:20−15:40, April 6, Room 403

Session Chair: **Malte Stodt (University of Bremen)**

14:20 #150: Direct numerical simulation of the evaporation-combustion interaction of fuel droplets in a turbulent flow

Hippolyte R Cléris (ONERA); Jean-Luc Estivalezes (ONERA); Sebastien Tanguy (IMFT); Olivier Rouzaud (ONERA); Anna-Federica Urbano (ISAE-Supaero)

14:40 #720: 3D numerical simulations of hydrogen combustion in fluidized beds

Enrica Masi (Institut de Mécanique des Fluides de Toulouse); Ivan Girault (IMFT); Gaétan Pierre (EDF); Benoit Bédat (Institut de Mécanique des Fluides de Toulouse); Amine Chadil (CNRS/MSME); Jerome Laviéville (EDF); Renaud Ansart (LGC); Hervé Neau (Institut de Mécanique des Fluides de Toulouse); Olivier Simonin (Institut de Mécanique des Fluides de Toulouse)

15:00 #291: CFD-DEM modeling of dynamic raceway in blast furnaces: effect of pulverized coal combustion on raceway formation

Chih-Chia Huang (Eindhoven University of Technology); Jeroen van Oijen (Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology); Yali Tang (Eindhoven University of Technology)

15:20 #779: Hydrogen combustion in an array of fixed inert particles

Ivan Girault (IMFT); Amine Chadil (CNRS/MSME); Enrica Masi (Institut de Mécanique des Fluides de Toulouse); Stéphane Vincent (MSME - Université Gustave Eiffel); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT)); Laurent Selle (IMFT)

S10 Instabilities 14:20−15:40, April 6, Room 404

Session Chair: **Hyungmin Park (Seoul National University)**

14:20 #119: Stability of two-phase stratified flow: effect of channel geometry

Ilya Barmak (Tel Aviv University); Alexander Gelfgat (Tel Aviv University); Neima Brauner (Tel-Aviv University)

14:40 #354: Effect of Plateau-Rayleigh instability on the transition of stratified liquid-liquid flow

Pedro José Miranda Lugo (University of São Paulo); Jorge Enrique Arrollo Caballero (universidade de são paulo); Marlon Hernandez Cely (Federal University of Pelotas); **Oscar Hernandez Rodriguez** (University of São Paulo)

15:00 #535: Experimental investigation of the transition between linear sloshing to chaotic regimes

Jean Muller (von Karman Institute (VKI)); Antonio Cantiani (von Karman Institute (VKI)); Philippe Planquart (von Karman Institute (VKI)); Delphine Laboureur (von Karman Institute (VKI))

15:20 #98: Sloshing in a food processor

Tomoaki Watamura (Kyoto Institute of Technology); Kazuyasu Sugiyama (Osaka University)

S10 Fluid-Structure Interactions 14:20−15:40, April 6, Room 405

Session Chair: **Shin-taro Takeuchi (Osaka University)**

14:20 #242: Free convection in magnetic nanofluids with the effect of magnetic field

Aditya Kumar (IIT Bombay); **Sudhakar Subudhi** (Indian Institute of Technology Roorkee)

14:40 #423: Dynamics of droplet motion in stenosed deformable microchannel

Kumar Amit (Indian Institute of Technology Patna); **Ashwani Assam** (Indian Institute of Technology Patna); Abhishek Raj (Indian Institute of Technology Patna)

15:00 #641: An experimental and numerical study on two-phase cross-flow in a tube bundle

Giuseppe Spina (IRSN); Daniele Vivald (IRSN)i; Guillaume Brillant (IRSN); Catherine Colin (IMFT); William Benguigui (EDF); Muriel Lelong (EDF)

15:20 #421: Retention dynamics of droplets over soft compliant substrates

Syed Ahsan Haider (Indian Institute of Technology, Patna, Bihta 801106); Rohit Rohit (Indian Institute of Technology, Patna, Bihta 801106); **Abhishek Raj** (Indian Institute of Technology Patna)

S10 Turbulence in Multiphase Flows 14:20−15:40, April 6, Room 406

Session Chair: **Stephen Ambrose (University of Nottingham)**

14:20 #126: Direct numerical simulation of droplet-laden homogeneous shear turbulence

Pablo Trefftz-Posada (University of Washington, Seattle); **Antonino Ferrante** (University of Washington, Seattle)

14:40 #289: A new model for large eddy simulations of particle-laden turbulent flows

Max Hausmann (Otto-von-Guericke University); Fabien Evrard (Otto-von-Guericke University Magdeburg); Berend van Wachem (University of Magdeburg)

15:00 #335: Charged particle dynamics in a vertical turbulence channel

Matthew T Gorman (Johns Hopkins University); Miguel X Diaz-Lopez (Johns Hopkins University); Rui Ni (Johns Hopkins University)

15:20 #549: Particle transport along the non-wavy free surface of turbulent water

Filippo Coletti (ETH Zurich); Roumaissa Hassaini (ETH Zurich); Yaxing Li (ETH Zurich); Kelken Chang (ETH Zurich); Claudio Mucignat (Empa)

S10 Bubbly Flows 14:20−15:40, April 6, Room 501

Session Chair: **Arup Kumar Das (IIT Roorkee)**

14:20 #309: Effects of the boundary conditions at the gas-liquid interface on single hydrogen bubble growth in alkaline water electrolysis

Faeze Khalighi (Eindhoven University of Technology); Yali Tang (Eindhoven University of Technology); Niels G Deen (Eindhoven University of Technology); Bert Vreman (Eindhoven University of Technology)

14:40 #410: The shear-induced lift force on freely moving and deformable bubbles

Niklas Hidman (Chalmers University of Technology); Henrik Ström (Chalmers University of Technology); Srdjan Sasic (Chalmers University of Technology); Gaetano Sardina (Chalmers University of Technology)

15:00 #415: Bubble dynamics under the influence of marangoni force induced by stratified contamination

Sadra Mahmoudi (Johannes Kepler University Linz - JKU); Mahdi Saeedipour (Johannes Kepler University); Mark W. Hlawitschka (Johannes-Kepler-University Linz)

15:20 #68: Mutable bubble surface mobility in water – alcohol mixtures and its impact on bubble motion and deformation

Pavlína Basařová (UCT Prague); Sandra Orvalho (Institute of Chemical Process Fundamentals of the CAS); Jakub Crha (UCT Prague, Institute of Chemical Process Fundamentals of the CAS); Lucie Pilikova (UCT Prague)

S10 OS: Granular Flow 14:20−15:40, April 6, Room 502

Session Chair: **Toshitsugu Tanaka (Osaka University)**

14:20 #407: Mechanical properties of hierarchical granular matter

Hiroaki Katsuragi (Osaka University); Fumiaki Okubo (Nagoya University); Tomomi Omura (Osaka Sangyo University)

14:40 #474: Rheology of a polymer-coated granular material

Franco Tapia (Tokyo Univ); Adrien Gans (Univ. Lorraine); Olivier Pouliquen (Aix-Marseille Univ); **Maxime Nicolas** (Aix-Marseille Univ)

15:00 #817: Evaluation of flowability and cohesiveness for cohesive particles of different particle properties using powder discharge test

Koichiro Ogata (National Institute of technology, Oita College); Shunta Tsukuma (National Institute of Technology, Oita College); Yuma Hirose (National Institute of Technology, Oita College)

15:20 #844: Flowability behaviour and rheological investigations of dry volcanic material responsible of the generation of volcaniclastic debris flows.

Ilaria Rucco (Heriot-Watt University); Ivan Marchante Gracia (Heriot-Watt University); Fabio Dioguardi (Università degli Studi di Bari “Aldo Moro”); Chongqiang Zhu (Heriot-Watt University); **Raffaella Ocone** (Heriot-Watt University)

S10 Mixing 14:20–15:40, April 6, Room 503

Session Chair: **Ameeya Kumar Nayak (Indian Institute of Technology Roorkee)**

14:20 #306: Scale down of a mixer: validation of a numerical model and investigation of the droplet size distribution

Quentin Laine (CEA); **Tojonirina Randriamanantena** (CEA); Fabrice Lamadie (CEA); Eric Olmos (Université de Lorraine)

14:40 #654: Flow and mixing in a rotating spherical container with a gas-liquid interface

Daiki Watanabe (Osaka University); Susumu Goto (Osaka University)

15:00 #117: Direct numerical simulations of the dispersion dynamics of complex flows in static mixers with surfactants

Juan P. Valdes (Imperial College London); Fuyue Liang (Imperial College London); Lyes Kahouadji (Imperial College London); Seungwon Shin (Hongik University); Jalel Chergui (LISN/CNRS); Damir Juric (LISN/CNRS); Omar Matar (Imperial College London)

15:20 #726: Numerical study of ethanol into water mixing using split and recombine micromixer

Amritendu B Ghosh (Indian Institute of Technology Kharagpur); Arnab Atta (Indian Institute of Technology Kharagpur)

S10 Multiphase Flow in Heat and Mass Transfer 14:20–15:40, April 6, Room 504

Session Chair: **Christos Markides (Imperial College London)**

14:20 #31: Evaporation and vapor mixing in turbulent two-phase flows

Leandro Germes Martinez (CORIA-UMR 6614); Benjamin Duret (CORIA-UMR 6614); Julien Reveillon (CORIA-UMR 6614); François-Xavier Demoulin (CORIA-UMR 6614)

14:40 #152: Investigation of two-phase flow in ascending pipeline using particle image velocimetry

Yubo Jin (Gyeongsang National University); Guangxin Ding (Gyeongsang National University); Hyoung-Bum Kim (Gyeongsang National University)

15:00 #411: Two-phase ionic liquid based aqueous biphasic systems for separation of biomolecules in small channels

Yiota Victoria Phakoukaki (UCL), Paul O'Shaughnessy (UCL); Panagiota Angeli (UCL)

15:20 #722: Thermal management of CBRN equipment using microchannels based heat sinks

Ana Sofia Oliveira H Moita (Academia Militar); Pedro Pontes (IST); Luis Quinto (CINAMIL - Academia Militar); Rui Lucena (CINAMIL - Academia Militar); Wilson Antunes (CINAMIL - Academia Militar); Luis Moreno (Academia Militar); Antonio Moreira (IN+ Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal.)

S10 OS: Bubbles and Drops (Drops) 14:20−15:40, April 6, Room 505

Session Chair: **Toshiyuki Sanada (Shizuoka University)**

14:20 #102: Central sheet formation from simultaneous impacts of two droplets on a dry substrate

Anjan Goswami (Imperial College London); Yannis Hardalupas (Imperial College London)

14:40 #122: Controlling droplet splashing and bouncing by dielectrowetting

Miguel Angel Quetzeri Santiago (University of Oxford); Rafael Castrejón-Pita (Queen Mary University of London); Alfonso Castrejón-Pita (University of Oxford)

15:00 #184: Experimental and numerical investigation of droplet impacts onto cubic pillars with a wetted base

Patrick A Palmetshofer (University of Stuttgart, Institute of Aerospace Thermodynamics); Weibo Ren (University of Stuttgart, Institute of Aerospace Thermodynamics); Jonas Steigerwald (University of Stuttgart, Institute of Aerospace Thermodynamics); Anne K. Geppert (University of Stuttgart, Institute of Aerospace Thermodynamics); Bernhard Weigand (University of Stuttgart, Institute of Aerospace Thermodynamics)

15:20 #605: Contact line instability induced by thermal effects during drop impact on heated surfaces

Takahiro Okabe (Hirosaki University); Keitaro Shirai (Hirosaki University); Takumi Okawa (Hirosaki University); Junnosuke Okajima (Tohoku University); Minori Shirota (Hirosaki University)

—— Coffee Break ——

S11 Particle-Laden Flows 16:00−17:20, April 6, Room 301

Session Chair: **Duan Zhang (Los Alamos National Laboratory)**

16:00 #338: The dynamics of particle clouds generated by a supersonic impinging jet

Juan S Rubio (Johns Hopkins University); Miguel X Diaz-Lopez (Johns Hopkins University); Matthew T Gorman (Johns Hopkins University); Rui Ni (Johns Hopkins University)

16:20 #256: Influence of the Stokes number on electrostatic charging of particle-laden duct flows

Wenchao Xu (Physikalisch-Technische Bundesanstalt); Manuella Mbami Reubo (Physikalisch-Technische Bundesanstalt); Holger Grosshans (Physikalisch-Technische Bundesanstalt)

16:40 #514: Universal scaling of non-axisymmetric fibers tumbling rate in channel flow turbulence

Mobin Alipour (Yale University); Marco De Paoli (TU Wien); **Alfredo Soldati** (TU Wien)

17:00 #160: Fiber kinematics in a turbulent channel flow

Subhani Shaik (Technion - Israel Institute of Technology); **Rene van Hout** (Technion - Israel Institute of Technology)

S11 OS: Micro- and Nano-Scale Multiphase Flows 16:00−17:20, April 6, Room 401

Session Chair: **Ruri Hidema (Kobe University)**

16:00 #28: Focusing and agglomeration of microplastics under acoustic standing waves

Nol Schaars (Eindhoven University of Technology); Nico Dam (Eindhoven University of Technology); **Yali Tang** (Eindhoven University of Technology)

16:20 #67: Gravity driven flow induced micro filtration device for medium to high concentration samples

Prasanth Gunipe (IIT Roorkee); Arup Kumar Das (IIT Roorkee)

16:40 #422: Numerical study on the effect of wettability of a particulate bed on melt infiltration kinetics

Liang Chen (KTH); Walter Villanueva (KTH)

17:00 #785: Multiscale simulation of two-phase flow in porous transport layer

David Mueller (Institute of Fluid Mechanics, Karlsruhe Institute of Technology); Alexander Stroh (Institute of Fluid Mechanics, Karlsruhe Institute of Technology)

S11 Reactive Multiphase Flows 16:00−17:40, April 6, Room 403

Session Chair: **Daniele Marchisio (Politecnico di Torino)**

16:00 #531: Intensifying gas-liquid photochemical reactions in microreactors with ultrasound

Keiran Mc Carogher (KU Leuven); William Cailly (KU Leuven); **Simon Kuhn** (KU Leuven)

16:20 #382: Effect of particle dispersion on particulate emissions in entrained flow reactors under acoustic excitation

Marcelo Dal Belo Takehara (Luleå University of Technology); Kentaro Umeki (Luleå University of Technology); Rikard Gebart (Luleå University of Technology)

16:40 #485: Spray and flow trajectories in nanoparticle producing spray flames

Malte F.B. Stodt (Leibniz-Institute for Materials Engineering, Technische Thermodynamik, Universität Bremen); Lizoel Buss (Leibniz-Institute for Materials Engineering); Johannes Kiefer (Technische Thermodynamik, Universität Bremen); Udo Fritsching (University Bremen)

17:00 #470: Numerical simulation of Marangoni convection near a hydrogen bubble growing on a microelectrode

Aled M. Meulenbroek (Eindhoven University of Technology); Bas W.J. Bernts (Eindhoven University of Technology); Niels G. Deen (Eindhoven University of Technology); Albertus W. Vreman (Eindhoven University of Technology)

17:20 #812: Full-cycle/multi-scale lithium-ion behavior mechanism in lithium-sulfur batteries

Jae Yong Cho (Yonsei University MFDL); Se Young Kim (Yonsei University MFDL); Joon Sang Lee (Yonsei University MFDL)

S11 Instabilities 16:00−17:00, April 6, Room 404

Session Chair: **Oscar Rodriguez (University of Sao Paolo)**

16:00 #724: Photoelastic measurement and numerical investigation on viscous fingering

Misa Kawaguchi (Tokyo University of Agriculture and Technology); Harumi Yagi (Tokyo University of Agriculture and Technology); Ryuta X. Suzuki (Tokyo University of Agriculture and Technology); Masakazu Muto (Nagoya Institute of Technology); Yuichiro Nagatsu (Tokyo University of Agriculture and Technology); Yoshiyuki Tagawa (Tokyo University of Agriculture and Technology)

16:20 #695: Contact line driven instability of thin fluid film over spherical surface

Ananthan Mohan (Indian Institute of Science Bangalore); Gaurav Tomar (Indian Institute of Science Bangalore)

16:40 #688: Dynamics of liquid alloy elongation and pinch-off process

Mengjia Ren (Kyushu University); Haruka Yasuhara (Kyushu University); Zhengying Wang (Kyushu University); Chihiro Inoue (Kyushu University)

S11 Bio-Fluids 16:00−17:00, April 6, Room 405

Session Chair: **Shunichi Ishida (Kobe University)**

16:00 #340: A physically accurate numerical model to simulate deformable membranes

Anirudh Asuri Mukundan (University of British Columbia); Anthony Wachs (University of British Columbia)

16:20 #819: Improvement of organ decellularization and recellularization process with multiphase flow technology

Akari Misawa (Tokyo Metropolitan University); Rinka Matsui (Tokyo Metropolitan University); Van Lap Nguyen (Tokyo Metropolitan University); Hiromichi Obara (Tokyo Metropolitan University)

16:40 #831: Cell incubation and manipulation technology with liquid-liquid double layer system

Tatsuki Kagiya (Tokyo Metropolitan University); Weijun Zhu (Tokyo Metropolitan University); Rei Ebihara (Tokyo Metropolitan University); Hiromichi Obara (Tokyo Metropolitan University)

S11 Turbulence in Multiphase Flows 16:00−18:00, April 6, Room 406

Session Chair: **Antonino Ferrante (Univeristy of Washington, Seattle)**

16:00 #850: Wall pressure measurements in slug flow

Juliana R Cenzi (UNICAMP); Daniely das Neves (University of Brasília); Virgilio Cetano (University of Campinas); Adriano T. Fabro (Universidade de Brasília); Marcelo S Castro (UNICAMP)

16:20 #413: Influence of salt on bubbly drag reduction

Luuk J. Blaauw (University of Twente); Detlef Lohse (Physics of Fluids Group, Max-Planck Center Twente for Complex Fluid Dynamics & JM Burgers Center, Department of Science and Technology, University of Twente); Sander Huisman (Universiteit Twente)

16:40 #693: Sampling scheme for wall shear stress in bubbly channel flow by variable-interval time-averaging method

Yoshihiko Oishi (Muroran Institute of Technology); Hyun Jin Park (Hokkaido University); Yuichi Murai (Hokkaido University); Yuji Tasaka (Hokkaido University); Hideki Kawai (Muroran Institute of Technology)

17:00 #266: Scale resolving simulations of wavy shear driven stratified gas-liquid flow in a horizontal channel

Evgenia Korsukova (University of Nottingham); **Stephen Ambrose** (University of Nottingham); Luc Bertolotti (University of Nottingham); Richard Jefferson Loveday (University of Nottingham)

17:20 #579: An inter-comparison study of flow modulation and wall drag in a turbulent channel flow laden with different dispersed phases

Lian-Ping Wang (Southern University of Science and Technology); Yu Guo (Zhejiang University); Dingyi Pan (Zhejiang University); Zhenhua Xia (Zhejiang University); Peng Yu (Southern University of Science and Technology); Zhiqiang Dong (Southern University of Science and Technology); Jun Lai (Southern University of Science and Technology); Yang Li (Zhejiang University); Yi Liu (Zhejiang University); Kairzhan Karzhaubayev (Southern University of Science and Technology); Runyang Qiu (Zhejiang University); Chunhua Zhang (Southern University of Science and Technology); Zehua Zhang (Southern University of Science and Technology)

17:40 #520: Experimental study of the evolution of solitary slugs in a horizontal pipeline

Vitor O. O. Machado (NUEM); **Marco Conte** (NUEM); Roel Belt (TOTAL Energies); Thierry Palermo (TOTAL Energies); Moisés Neto (NUEM); Rigoberto E. M. Morales (NUEM - UTFPR)

S11 Bubbly Flows 16:00−17:40, April 6, Room 501

Session Chair: **Amos Ullmann (Tel Aviv University)**

16:00 #650: Bubble breakup characteristics in a Venturi tube under high gas flow ratio

Noor Saffreena Binti Hamdan (University of Tsukuba); Akiko Kaneko (University of Tsukuba)

16:20 #111: Experiments and modelling of near-horizontal bubbly flow

Jørn Kjølaas (SINTEF); Diana Gonzalez (SINTEF); Heiner Schumann (SINTEF)

16:40 #687: Experiments and simulation on the performance of a large-scale airlift pump for air-water and air-slurry operation

Kazuya Shimizu (The University of Tokyo); Shu Takagi (The University of Tokyo)

17:00 #106: Three-phase flow analysis of rising shallow methane hydrate in gas lift system

Yoshinari Kidaka (Osaka University); Kazuyasu Sugiyama (Osaka University)

17:20 #813: Passage of bubble across a liquid-liquid interface in the presence of regular waves

Rupak Kumar (IIT Roorkee); Arup Kumar Das (IIT Roorkee)

S11 OS: Granular Flow 16:00−17:40, April 6, Room 502

Session Chair: **Maxime Nicolas (Aix Marseille University-CNRS)**

16:00 #872: CFD-DEM modeling of gas-solid reacting flow (rCFD-DEM): from new approaches to industry applications

Yansong Shen (University of New South Wales)

16:20 #379: Numerical analysis of hysteresis of granular flow on an inclined plane

Clovis Lambert (IMFT); Raphaël Maurin (Institut de Mécanique des Fluides de Toulouse (IMFT)); Marcan Graffin (Université de Toulouse); Laurent Lacaze (Institut de Mécanique des Fluides de Toulouse (IMFT)); Sylvain Viroulet (Institut de Mécanique des Fluides de Toulouse (IMFT)); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT))

16:40 #468: Influence of capillary forces on non-Local granular fluidity

Dorian Faroux (Osaka University); Kimiaki Washino (Osaka University); Takuya Tsuji (Osaka University); Toshitsugu Tanaka (Osaka University)

17:00 #658: Jamming in plane Poiseuille flow of granular materials

Kenta Hayashi (Osaka University); Kiwamu Yoshii (Osaka University); **Michio Otsuki** (Osaka University)

17:20 #871: CFD study of co-injection of hydrogen and coal in a blast furnace

Yiran Liu (University of New South Wales); Yansong Shen (University of New South Wales)

S11 Mixing 16:00−17:20, April 6, Room 503

Session Chair: **Tojonirina Randriamanantena (CEA Marcoule)**

16:00 #562: Development of an experimental protocol to study the effect of shear rate on sweep flocculation in a water-in-oil emulsion

Marcio B Machado (University of Alberta); Aakanksha Bhargava (University of Alberta); R. Sean Sanders (University of Alberta)

16:20 #358: Electroosmotic migration and mixing of viscoelastic fluid in micro nozzle/diffuser

Ameeya Kumar Nayak (IIT Roorkee); Minakshmi Majhi (IIT Roorkee); Bernhard Weigand (University of Stuttgart)

16:40 #677: Numerical study of mixing in reactive jet impingement (ReJI) for 3D bioprinting

Elfego Ruiz-Gutierrez (Newcastle University); Josef Hasslberger (Bundeswehr University Munich); Markus Klein (Bundeswehr University); Kenny Dalgarno (Newcastle University); Nilanjan Chakraborty (Newcastle University)

17:00 #303: Numerical study of the flow dynamics of bi-swirl injector using OpenFOAM

Vishnu Natarajan (Pusan National University); Jeong-Yeol Choi (Pusan National University)

S11 Multiphase Flow in Heat and Mass Transfer 16:00−17:40, April 6, Room 504

Session Chair: **Christos Markides (Imperial College London)**

16:00 #87: Heat transport and flow structure in turbulent multi-phase Rayleigh-Bénard convection

Detlef Lohse (Physics of Fluids Group, Max-Planck Center Twente for Complex Fluid Dynamics & JM Burgers Center, Department of Science and Technology, University of Twente); Hao-Ran Liu (University of Twente); Kai Leong Chong (University of Twente); Rui Yang (University of Twente); Robetro Verzicco (University of Twente)

16:20 #625: Two-layer Rayleigh-Bènard with evaporation: interface temperature and Nusselt number

Nicolo Scapin (KTH); Andreas Demou (The Cyprus Institute, Nicosia); **Luca Brandt** (Norwegian University of Science of Technology, Department of Energy and Process Engineering Faculty of Engineering)

16:40 #135: Numerical study on the thermal effect of porous media in Rayleigh-Bénard convection

Jun Zhong (Tsinghua University); Shuang Liu (Tsinghua University); Chao Sun (Tsinghua University)

17:00 #281: Boiling and condensation of a two-phase closed thermosyphon under horizontal vibration

Sohyeun Kang (KAIST); Daegyoum Kim (KAIST)

17:20 #760: 1D mixture model code for the modelization of two-phase flow thermosiphon

Pierre A Boyer (IMFT); Catherine Colin (IMFT); Thomas Prusek (EDF R&D)

S11 OS: Bubbles and Drops (Drops) 16:00−17:20, April 6, Room 505

Session Chair: **Miguel Angel Quetzeri Santiago (University of Oxford)**

16:00 #672: Solidification pattern formed by thermal conduction of molten metal drops spreading on a substrate

Takumi Okawa (Hirosaki University); **Yusuke Nakagawa** (Hirosaki University); Kazuaki Maeda (Hirosaki University); Takahiro Okabe (Hirosaki University); Minori Shirota (Hirosaki University)

16:20 #139: Controlled ferrofluid droplet impact under the influence of a magnetic field

Sudip Shyam (University of Waterloo); Utsab Banerjee (University of Waterloo); Sushanta Mitra (University of Waterloo)

16:40 #123: Evaluation of large sessile drops interface under gravity and electric fields

Alekos Ioannis Garivalis (DESTEC, University of Pisa); Salvatore Lobianco (DESTEC, University of Pisa); Alexey Rednikov (2TIPs, Universitè libre de Bruxelles (ULB)); Paolo Di Marco (DESTEC, University of Pisa)

17:00 #649: Suppression of the dimple formation of impacting drops by electrical charge

Keitaro Shirai (Hirosaki University); **Ayaka Kodama** (Hirosaki University); Taimei Miyagawa (Hirosaki University); Takahiro Okabe(Hirosaki University); Yohsuke Matsushita (Hirosaki University); Yasuhiro Saito (Kyushu Institute of Technology); Yoshiya Matsukawa (Tohoku University); Hideyuki Aoki (Tohoku University); Masatoshi Daikoku (Hachinohe Institute of Technology); Junichi Fukano (Honda Motor); Minori Shirota (Hirosaki University)

Friday, April 7, 2023

(Plenary Lecture) **Shu Takagi (The University of Tokyo)** Dynamics of a Rising Bubble and Bubble Cluster, 9:00−9:50, Main Hall, Chairperson: Dominique Legendre (Institut de Mécanique des Fluides de Toulouse)

—— Coffee Break ——

S12 Particle-Laden Flows 10:10−11:50, April 7, Room 301

Session Chair: **Jochen Fröhlich (Technical University of Dresden)**

10:10 #93: Effects of Stokes number on mono- and bi-disperse particle-laden Couette flows from particle-resolved direct numerical simulations

Oliver Scorsim (Institut de Mécanique des Fluides de Toulouse (IMFT)); **Pascal Fede** (Institut de Mécanique des Fluides de Toulouse (IMFT)); Olivier Simonin (Institut de Mecanique des Fluides de Toulouse (IMFT))

10:30 #367: Settling of prolate spheroids in quiescent fluid at different volume fractions

Xinyu Jiang (Tsinghua University); Chunxiao Xu (Tsinghua University); Lihao Zhao (Tsinghua University)

10:50 #389: Entrainment dynamics and modeling of a particle-laden plume

Alec J Petersen (UC Irvine); Filippo Coletti (ETH Zurich)

11:10 #390: Interaction of puffs and particles in transitional particle-laden pipe flow

Sagnik Paul (University of Minnesota, Twin Cities); **Ellen Longmire** (University of Minnesota)

11:30 #533: Fluid mediated particle interactions studied using the nearest particle statistics

Duan Z Zhang (Los Alamos National Laboratory); Min Wang (Los Alamos National Laboratory); Sivaramakrishnan Balachandar (University of Florida)

S12 OS: Micro- and Nano-Scale Multiphase Flows 10:10−11:30, April 7, Room 401

Session Chair: **Ryo Kurimoto (Kobe University)**

10:10 #34: Optimization of microfluidic synthesis of silver nanoparticles by coupled experiments and modelling

Konstantia Nathanael (University of Birmingham); Paula D Pico (Imperial College London); Sibo Cheng (Imperial College London); Nina M Kovalchuk (University of Birmingham); Alessio Lavino (Imperial College London); Rossella Arcucci (Imperial College London); Omar Matar (Imperial College London); Mark Simmons (University of Birmingham)

10:30 #105: Inertial focusing of red blood cells in square tube flows of blood plasma

Masako Sugihara-Seki (Kansai University); Saori Tanaka (Kansai University)

10:50 #384: A microfluidic in vitro model of microvascular collapse

Stephanie Hallam (University of Birmingham); **Pranav Vasanthi Bathrinarayanan** (University of Birmingham); Nina M Kovalchuk (University of Birmingham); Mark Simmons (University of Birmingham)

11:10 #497: Oil-water flow: nanoparticle effects on oil drop migration with coarse-grained computations

Thao Nguyen (University of Oklahoma); Sepideh Razavi (University of Oklahoma); **Dimitrios Papavassiliou** (University of Oklahoma)

S12 Special Session: Machine Learning for Multiphase Flows 10:10−11:50, April 7, Room 402

Session Chair: **Omar Matar (Imperial College London)**

10:10 #879: Physics-inspired machine learning for multiphase flow modeling

Sivaramakrishnan Balachandar (University of Florida)

10:30 #875: Examples of the use of machine learning for multiphase flow predictions

Gretar Tryggvason (Johns Hopkins University); Jiacai Lu (Johns Hopkins University)

10:50 #878: Review of machine learning for hydrodynamics, transport and reactions in multiphase flows and reactors

Li-Tao Zhu (Shanghai Jiao Tong University); Bo Ouyang (Shanghai Jiao Tong University); He Lei (Shanghai Jiao Tong University); **Zheng-Hong Luo** (Shanghai Jiao Tong University)

11:10 #877: Data-driven shape optimisation of chemical reactors

Nausheen Basha (Imperial College London); Thomas Savage (Imperial College London); Ehecatl Antonio del Rio Chanona (Imperial College London); Omar K. Matar (Imperial College London)

11:30 #876: Modelling local steady-state and time-dependent flow and transport in porous media by multiscale neural networks

Agnese Marcato (Politecnico di Torino); Javier E. Santos (Los Alamos National Laboratory); Chaoyue Liu (LRCS); Gianluca Boccardo (Politecnico di Torino); Alejandro A. Franco (LRCS); Masa Prodanovic (University of Texas at Austin); **Daniele Marchisio** (Politecnico di Torino);

S12 Reactive Multiphase Flows 10:10−11:10, April 7, Room 403

Session Chair: **Aled Meulenbroek (Eindhoven University of Technology)**

10:10 #739: An open-source computational framework for reactive solid-liquid flows

Mohsen Shiea (Politecnico di Torino); Andrea Querio (Politecnico di Torino); Antonio Buffo (Politecnico di Torino); Gianluca Boccardo (Politecnico di Torino); **Daniele Marchisio** (Politecnico di Torino)

10:30 #38: Cyclic reduction of combusted iron powder: study on the stability of material properties

Nicole C Stevens (Eindhoven University of Technology); Giulia Finotello (TU/e); Niels G Deen (Eindhoven University of Technology)

10:50 #686: Comparison of multicomponent diffusion models in single catalytic particles and packed bed reactors

Claire M.Y. Claassen (Eindhoven University of Technology); Samaneh Tadayon Mousavi (Eindhoven University of Technology); Stan Wintjens (Eindhoven University of Technology); Maike Baltussen (Eindhoven University of Technology); Frank Peters (Eindhoven University of Technology); Hans Kuipers (Eindhoven University of Technology)

S12 Instabilities 10:10−11:10, April 7, Room 404

Session Chair: **Tomoaki Watamura (Kyoto Institute of Technology)**

10:10 #750: Theoretical study of metal pad roll instability in a liquid metal battery.

Antoine Simon (INSA Rouen Normandie); Marie-Charlotte Renoult (INSA Rouen Normandie); Jorge César Brändle de Motta (CORIA); Christophe Dumouchel (CORIA / CNRS)

10:30 #781: Interfacial instabilities on the miscible liquids column generated by a rising deformable bubble

Kyuseong Choi (Seoul Nat'l Univ.); Hyungmin Park (Seoul Nat'l Univ.)

10:50 #818: Viscous theory for three-layer Rayleigh-Taylor instability

Antoine Simon (INSA Rouen Normandie); **Marie-Charlotte Renoult** (INSA Rouen Normandie)

S12 Environmental and Geophysical Flows 10:10−11:10, April 7, Room 406

Session Chair: **Udo Fritsching (Universität Bremen)**

10:10 #539: On airborne transmission from cooling towers

Xavier Lefebvre (École Polytechnique Montréal); Elliston Vallarino Reyes (McGill University); Emilie Bedard (École Polytechnique Montréal); Michele Prevost (Ecole Polytechnique de Montreal); Etienne Robert (École Polytechnique Montréal)

10:30 #492: Deliquescence of sub-micron sized NaCl-particles – comparing measurements and simulations

Silvio Schmalfuß (Leibniz Institute for Tropospheric Research (TROPOS)); Dennis Niedermeier (Leibniz Institute for Tropospheric Research (TROPOS)); Rasmus Hoffmann (Leibniz Institute for Tropospheric Research (TROPOS)); Frank Stratmann (Leibniz Institute for Tropospheric Research (TROPOS))

10:50 #292: Dual displacement fronts of fluid displacement in porous media: numerical simulations on double viscous fingerings

Anindityo Patmonoaji (Tokyo University of Agriculture and Technology); Yuichiro Nagatsu (Tokyo University of Agriculture and Technology)

S12 Bubbly Flows 10:10−11:50, April 7, Room 501

Session Chair: **Frederic Risso (Institut de Mecanique des Fluides de Toulouse)**

10:10 #447: Estimation of the diffusion of bubbles injected for the air lubrication on a flat-bottom ship

Hyun Jin Park (Hokkaido University); Yuichi Murai (Hokkaido University); Tatsuya Hamada (National Maritime Research Institute); Chiharu Kawakita (National Maritime Research Institute)

10:30 #298: New approaches for detecting the main transition velocities in a bubble column operated with aqueous solutions of ethanol and iso-propanol

Stoyan N Nedeltchev (Polish Academy of Sciences, Institute of Chemical Engineering); Jakub Katerla (Polish Academy of Sciences, Institute of Chemical Engineering); Sara Marchini (Helmholtz-Zentrum Dresden-Rossendorf, Institute of Fluid Dynamics); Ragna Kipping (Helmholtz-Zentrum Dresden-Rossendorf, Institute of Fluid Dynamics); Michael Knobel (Helmholtz-Zentrum Dresden-Rossendorf, Institute of Fluid Dynamics); Markus Schubert (Helmholtz-Zentrum Dresden-Rossendorf, Institute of Fluid Dynamics); Uwe Hampel (Helmholtz-Zentrum Dresden-Rossendorf, Institute of Fluid Dynamics)

10:50 #314: Study of hydrodynamics in a counter current bubble column

Haris Khan (Helmholtz-Zentrum Dresden - Rossendorf (HZDR)); Roland Rzehak (Helmholtz-Zentrum Dresden - Rossendorf (HZDR)); Peter Kovats (Otto-von-Guericke-University Magdeburg (OVGU)); Katharina Zaehringer (Otto-von-Guericke-University Magdeburg (OVGU))

11:10 #560: Measuring the liquid velocities at the wall of the rectangular Limerick bubble column

Saikat Bhowmick (University of Limerick, School of Engineering,Bernal Institute); Harry E.A. Van den Akker (University of Limerick, School of Engineering, Bernal Institute)

11:30 #865: CFD-based discrete particle modelling of mono- & poly-dispersed gas bubbles in a solid catalyzed dilute slurry flow bubble column

Parul Tyagi (Indian Institute of Technology Roorkee); Shubhali Singh (IIT Roorkee, India); Vimal Kumar (IIT Roorkee, India)

S12 OS: Two-phase Flow Systems under Microgravity 10:10−11:50, April 7, Room 502

Session Chair: **Paolo di Marco (University of Pisa)**

10:10 #233: Numerical analyses of transcritical nanodroplet evaporation and mixing

Nguyen Ly (Stanford University); Arijit Majumdar (Stanford University); Matthias Ihme (Stanford University)

10:30 #860: About aerosol properties in microgravity conditions

Charles Graziani (Aix-Marseille University); M. Nespoulous (Aix-Marseille University); R. Denoyel (Aix-Marseille University); S. Fauve (LP ENS-Paris); C. Chauveau (ICARE University Orleans); L. Deike (MAE/HMEI Princeton University); M. Antoni (Aix-Marseille University)

10:50 #586: Capillary wicking in porous medium with wettability differences for liquid transport technology under microgravity

Gaku Murakami (Tokyo University of Science); Kizuku Kurose (Tokyo University of Science); Masato Sakurai (Japan Aerospace Exploration Agency); Ichiro Ueno (Tokyo University of Science)

11:10 #209: Vapor bubble growth in liquid methane in a microgravity environment

Niklas Weber (University of Bremen); Michael Dreyer (University of Bremen)

11:30 #847: Two-phase flow experiments onboard international space station - analysis of bubble behaviors in adiabatic circular channel

Hitoshi Asano (Kobe University); Osamu Kawanami (University of Hyogo); Koichi Inoue (The University of Kitakyushu); Koichi Suzuki (Tokyo University of Science); Ryoji Imai (Muroran Institute of Technology); Satoshi Matsumoto (JAXA); Haruhiko Ohta (Kyushu University)

S12 Mixing 10:10−11:50, April 7, Room 503

Session Chair: **Elfego Ruiz-Gutierrez (Newcastle University)**

10:10 #544: Identification of compartments in stirred tank reactors by analysing Lagrangian coherent structures from velocity fields derived by the lattice-Boltzmann-method

Christian Weiland (Hamburg University of Technology); Eike Steuwe (Hamburg University of Technology); Alexandra von Kameke (Hamburg University of Applied Sciences); Marko Hoffmann (Hamburg University of Technology); Michael Schlüter (Hamburg University of Technology)

10:30 #596: Hydrodynamic characterization and identification of heterogeneities in stirred tank reactors by means of 4D particle trajectories

Jürgen Fitschen (Hamburg University of Technology); **Felix Kexel** (Hamburg University of Technology);Sebastian Hofmann (Hamburg University of Technology); Maike Kuschel (Boehringer Ingelheim Pharma GmbH & Co. KG); Marko Hoffmann (Hamburg University of Technology); Thomas Wucherpfennig (Boehringer Ingelheim Pharma GmbH & Co. KG); Michael Schlüter (Hamburg University of Technology)

10:50 #109: Numerical simulation of surfactant-laden emulsion formation in a stirred vessel

Fuyue Liang (Imperial College London); Juan P. Valdes (Imperial College London); Lyes Kahouadji (Imperial College London); Seungwon Shin (Hongik University); Jalel Chergui (LISN-CNRS); Damir Juric (LISN-CNRS); Omar Matar (Imperial College London)

11:10 #115: Modelling and simulation of particle milling in a stirred tank using a coupled approach CFD-PBE

Zoé Am Mercier (CEA); Pascal Fede (Institut de Mécanique des Fluides de Toulouse (IMFT)); Maxime Pigou (IMFT); Eric Climent (IMFT); Jean-Philippe Bayle (CEA, DES, ISEC, DMRC, Universite de Montpellier); Eric Tronche (CEA, DES, ISEC, DMRC, Universite de Montpellier)

11:30 #594: Numerical investigations of mixing in a shallow vessel: role of recirculatory flow structures and turbulent transport

Sayantan Biswas (IIT Delhi); Vivek Buwa (IIT Delhi)

S12 Multiphase Flow in Heat and Mass Transfer 10:10−11:50, April 7, Room 504

Session Chair: **Vincent Moureau (CNRS)**

10:10 #604: Investigation of aerodynamic weber number effect on atomization and evaporation processes in crossflow

Kenya Kitada (Kyoto University); Abhishek Lakshman Pillai (Kyoto University); Ryoichi Kurose (Kyoto University)

10:30 #277: Numerical study of high Prandtl number liquid jet impacting a heated wall: application to the cooling of electric machines

Xiaohan Bai (IFPEN); **Adele Poubeau** (IFPEN); Guillaume Vinay (IFP Energies nouvelles); Clement Renon (P' Institute, CNRS, ENSMA); Matthieu Fenot (P' Institute, CNRS, ENSMA)

10:50 #416: Ablation of a solid by a circular immersed or free-surface jet

Antoine Avrit (Université de Lorraine, LEMTA); Michel Gradeck (Université de Lorraine, LEMTA); Nicolas D. Rimbert (Université de Lorraine); Alexandre Lecoanet (CEA, IRESNE, DTN, SMTA); Nathalie Seiler (CEA, IRESNE, DTN, SMTA)

11:10 #448: Natural convection heat transfer between vertical parallel plates in water with millimeter-bubble injection

Atsuhide Kitagawa (Kyoto Institute of Technology); Yuichi Murai (Hokkaido University)

11:30 #494: Thermal sub-grid boundary layer modelling around bubbles at moderate Reynolds and Prandtl numbers

Mathis Grosso (CEA); Guillaume Bois (CEA); Adrien Toutant (PROMES, CNRS)

S12 OS: Bubbles and Drops (Drops) 10:10−11:50, April 7, Room 505

Session Chair: **Toshiyuki Sanada (Shizuoka University)**

10:10 #776: Climbing mechanism of self-propelled drops on a ratchet with hiybrid wettability in the low-temperature regime

Minori Shirota (Hirosaki University); Tomomichi Shirahama (Hirosaki University); Ryota Ato (Hirosaki University); Takahiro Okabe (Hirosaki University)

10:30 #705: Lubrication type model for wetting dynamics of multicomponent droplets

Zhenying Wang (Kyushu University); Prashant Valluri (University of Edinburgh); George Karapetsas (Aristotle University of Thessaloniki); Chihiro Inoue (Kyushu University)

10:50 #822: Droplet jump from particle bed

Karl Cardin (Portland State University); Facundo Cabrera (Portland State University); Raúl B Cal (Portland State University)

11:10 #32: Theoretical and numerical analysis of wave converging inside the two-dimensional cylindrical water column impinged by a curved shock wave

Sheng Xu (Tsinghua University); Bing Wang (Tsinghua University)

11:30 #575: Numerical investigation of high-speed droplet impact on flat surfaces with different wettability

Tianyi Wei (Kyoto University); Abhishek Lakshman Pillai (Kyoto University); Ryoichi Kurose (Kyoto University)

Closing 11:50−12:20 Main Hall

Instructions for Presenters

Oral Presentations

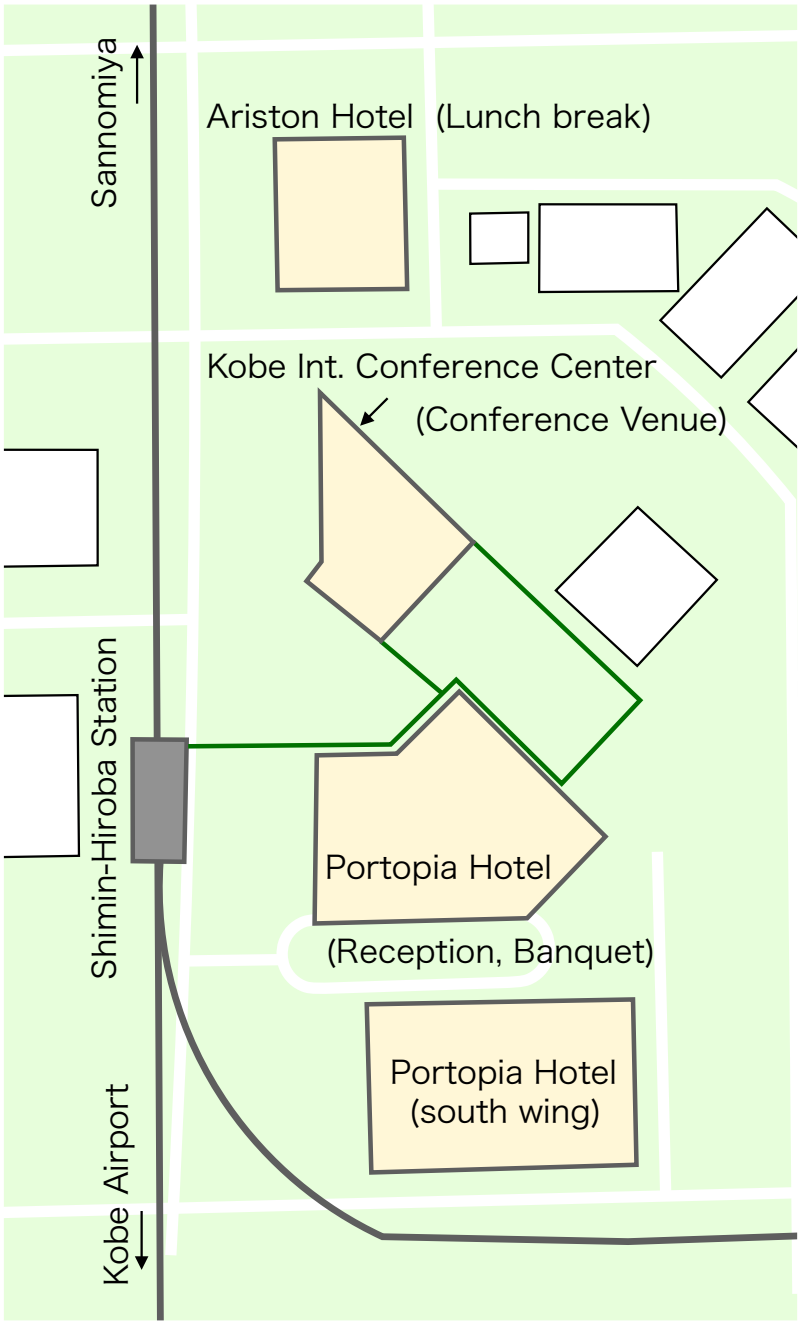
- Each presentation has 20 minutes including discussion.
- Use your own computer for your presentation. The conference does not provide computers for presentation. The type of connection with the projector is HDMI. If your computer does not have any HDMI ports, please prepare an adaptor by yourself.
- Please notify the session chair of your name for confirmation of your attendance and check that your presentation is displayed correctly before the session begins.

Poster Presentations

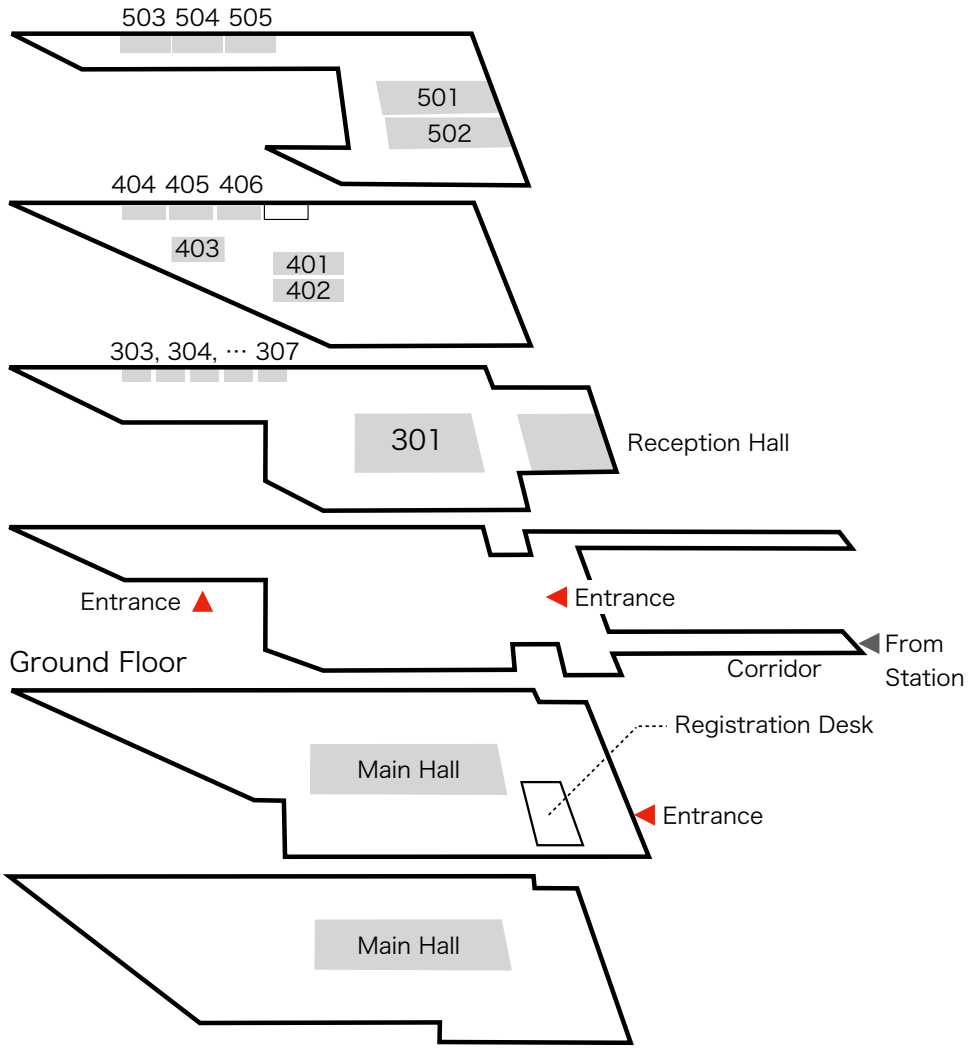
- The Poster Session with Beer is scheduled at 1620-17:40 on April 3rd (Monday). The session room is the Reception Hole on the 3rd floor.
- Please set your poster on the panel board labeled with your poster number (P#) by noon on 3rd April. You poster number can be found in the program available on the Program page.
- Please stay by your poster during the session for discussion with participants.
- It is recommended to keep the poster on the board after the session for participants. However, please remove the poster by 16:00 on 5th April (Wednesday). The poster boards will be removed after this time.
- The board size is for A0 (841 mm x 1189 mm (33 inch x 46.8 inch)).
- Some pins will be prepared on the board for putting the poster up.
- The sizes of characters and figures should be large enough for readability.

Conference Venue

Kobe International Conference Center
6-9-1, Minatojima-nakamachi, Chuo-ku, Kobe-shi, Hyogo, 650-0046, Japan



Conference Rooms



Registration Desk : Entrance of Main Hall

Plenary and Award lectures; Opening, Closing : Main Hall

Keynote lectures : Main Hall / 301

Technical Sessions:
301, 401, 402, 403, 404, 405, 406, 501, 502, 503, 504, 505

Poster Session: Reception Hall

305, 306 and 307 will be available for participants.

Promotion

The Japanese Society for Multiphase Flow
The Virtual International Research Institute of Two-Phase Flow and Heat Transfer

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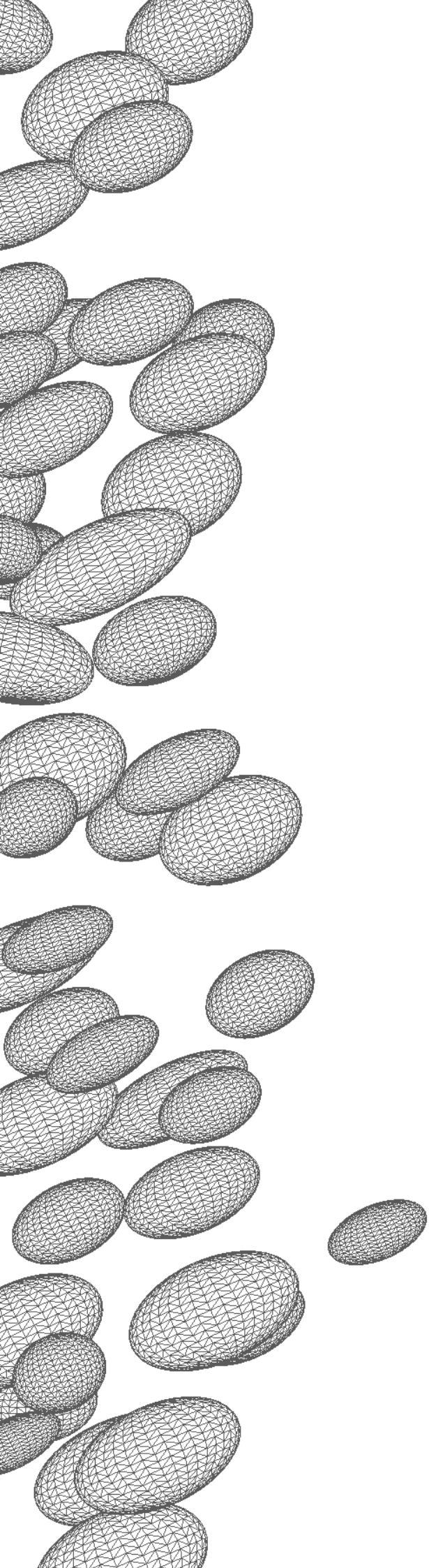

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