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Editorial

Numerical Simulation of Fluid Flow and Heat Transfer Processes

Bo Yu,[1] Tomoaki Kunugi,[2] Toshio Tagawa,[3] Shuyu Sun,[4] Moran Wang,[5] and Yi Wang[1,4]

[1] *National Engineering Laboratory for Pipeline Safety, Beijing Key Laboratory of Urban Oil and Gas Distribution Technology, China University of Petroleum, Beijing 102249, China*
[2] *Department of Nuclear Engineering, Kyoto University, C3-d2506, Kyoto Daigaku-Katsura, Nishikyo-Ku, Kyoto 615-8540, Japan*
[3] *Department of Aerospace Engineering, Tokyo Metropolitan University, 6-6 Asahigaoka, Hino, Tokyo 191-0065, Japan*
[4] *Computational Transport Phenomena Laboratory, Division of Physical Science and Engineering, King Abdullah University of Science and Technology, Thuwal 23955-6900, Saudi Arabia*
[5] *Department of Engineering Mechanics and CNAM, Tsinghua University, Beijing 100084, China*

Correspondence should be addressed to Bo Yu; yubobeng@vip.163.com

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Fluid flow and heat transfer processes are ubiquitous in nature and engineering. They exist in many aspects of industrial operations and daily life. Numerical simulations of these processes have been important methods for fundamental and applicable researches. This special issue focuses on the latest achievements in the two aspects. We received 63 active submissions from the United States of America, Canada, Mexico, France, Italy, Norway, Saudi Arabia, Turkey, China, Japan, Pakistan, Republic of Korea, and so forth and finally accepted 35 research articles to publish them in the special issue after peer reviews. The topics cover the researches having solid theoretical fundaments including turbulent fluid flow and heat/mass transfer and the researches having strong backgrounds of applications.

In the field of turbulent fluid flow, 10 articles have been published. The following articles make efforts on direct numerical simulation (DNS), the Reynolds averaged Navier-Stokes (RANS) model, and large eddy simulation (LES) of turbulence. The article "*DNS study of the turbulent Taylor-vortex flow on a ribbed inner cylinder*" by T. Tsukahara et al. shows the investigation of turbulent Taylor-vortex flows over regularly spaced square ribs mounted on a rotating inner cylinder surface. The authors find that Taylor vortices remaining over roughened cylinder surfaces can lead to less pressure drag and an enhanced backflow in the recirculation zone. The article "*Turbulence modulation by small bubbles in the vertical upward channel flow*" by M. Pang et al. presents the mechanisms of the liquid turbulence modulation induced by the addition of small bubbles. Intensified turbulence near the wall and slightly weakened turbulence in the channel region are discovered. In the article entitled "*A modified k-ε model for computation of flows with large streamline curvature*" by J.-L. Yin et al., the authors propose an improved RANS model for system rotation and streamline curvature effects and provide an effective way for turbulence modeling. In the article entitled "*Large eddy simulation of inertial particle preferential dispersion in a turbulent flow over a backward-facing step*" by B. Wang et al., LES of a turbulent flow with inertial particle dispersion over a backward-facing step is performed. The research conclusions are useful for further understanding the two-phase turbulence physics and establishing accurate engineering prediction models of particle dispersion. In the article "*Comparisons of LES and RANS computations with PIV experiments on a cylindrical cavity flow*" by W.-T. Su et al., RANS and LES methods are compared. The results show that LES is more suitable for predicting the complex flow characteristics inside complicated three-dimensional (3D) geometries. In the article "*Experimental validation of volume of fluid method for a sluice gate flow*" by A. A. Oner et al., two-dimensional (2D) open channel flow under a vertical sluice gate can be successfully analyzed by the volume of fluid (VOF) method-based modeling after the experimental validation. The following four articles focus on aerodynamics or drag reduction. "*Aerodynamic performance prediction of straight-bladed vertical axis wind turbine based on CFD*" by L. X. Zhang et al. demonstrates that the leading edge separation

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William Layton

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Numerical Simulation of Fluid Flow and Heat/Mass Transfer Processes N.C. Markatos,D.G. Tatchell,M. Cross,N. Rhodes,2012-12-06 Computational fluid flow is not an easy subject Not only is the mathematical representation of physico chemical hydrodynamics complex but the accurate numerical solution of the resulting equations has challenged many numerate scientists and engineers over the past two decades The modelling of physical phenomena and testing of new numerical schemes has been aided in the last 10 years or so by a number of basic fluid flow programs MAC TEACH 2 E FIX GENMIX etc However in 1981 a program perhaps more precisely a software product called PHOENICS was released that was then and still remains arguably the most powerful computational tool in the whole area of endeavour surrounding fluid dynamics The aim of PHOENICS is to provide a framework for the modelling of complex processes involving fluid flow heat transfer and chemical reactions PHOENICS has now been is use for four years by a wide range of users across the world It was thus perceived as useful to provide a forum for PHOENICS users to share their experiences in trying to address a wide range of problems So it was that the First International PHOENICS Users Conference was conceived and planned for September 1985 The location at the Dartford Campus of Thames Polytechnic in the event proved to be an ideal site encouraging substantial interaction between the participants *Flow and Heat or Mass Transfer in the Chemical Process Industry* Dimitrios V. Papavassiliou,Quoc T. Nguyen,2018-09-28 This book is a printed edition of the Special Issue Flow and Heat or Mass Transfer in the Chemical Process Industry that was published in Fluids **Applications of Mathematical Heat Transfer and Fluid Flow Models in Engineering and Medicine** Abram S. Dorfman,2017-02-06 Applications of mathematical heat transfer and fluid flow models in engineering and medicine Abram S Dorfman University of Michigan USA Engineering and medical applications of cutting edge heat and flow models This book presents innovative efficient methods in fluid flow and heat transfer developed and widely used over the last fifty years The analysis is focused on mathematical models which are an essential part of any research effort as they demonstrate the validity of the results obtained The universality of mathematics allows consideration of engineering and biological problems from one point of view using similar models In this book the current situation of applications of modern mathematical models is outlined in three parts Part I offers in depth coverage of the applications of contemporary conjugate heat transfer models in various industrial and technological processes from aerospace and nuclear reactors to drying and food processing In Part II the theory and application of two recently developed models in fluid flow are considered the similar conjugate model for simulation of biological systems including flows in human organs and applications of the latest developments in turbulence simulation by direct solution of Navier Stokes equations including flows around aircraft Part III proposes fundamentals of laminar and turbulent flows and applied mathematics methods The discussion is complimented by 365 examples selected from a list of 448 cited papers 239 exercises and 136 commentaries Key features Peristaltic flows in normal and pathologic human organs

Modeling flows around aircraft at high Reynolds numbers Special mathematical exercises allow the reader to complete expressions derivation following directions from the text Procedure for preliminary choice between conjugate and common simple methods for particular problem solutions Criterions of conjugation definition of semi conjugate solutions This book is an ideal reference for graduate and post graduate students and engineers **Numerical Simulation of Heat Exchangers** W. J. Minkowycz,E. M. Sparrow,J.P Abraham,J. M. Gorman,2017-04-07 This book deals with certain aspects of material science particularly with the release of thermal energy associated with bond breaking It clearly establishes the connection between heat transfer rates and product quality The editors then sharply draw the thermal distinctions between the various categories of welding processes and demonstrate how these distinctions are translated into simulation model uniqueness The book discusses the incorporation of radiative heat transfer processes into the simulation model Mathematical Modeling of Food Processing Mohammed M. Farid,2010-05-21 Written by international experts from industry research centers and academia Mathematical Modeling of Food Processing discusses the physical and mathematical analysis of transport phenomena associated with food processing The models presented describe many of the important physical and biological transformations that occur in food during proces *Handbook of Porous Media* Kambiz Vafai,2015-06-23 Handbook of Porous Media Third Edition offers a comprehensive overview of the latest theories on flow transport and heat exchange processes in porous media It also details sophisticated porous media models which can be used to improve the accuracy of modeling in a variety of practical applications Featuring contributions from leading experts i **Applied mechanics reviews** ,1948 Towards Nanofluids for Large-Scale Industrial Applications Bharat A. Bhanvase,Divya Barai,Gaweł Zyła,Zafar Said,2024-05-03 Nanofluids for Large Scale Industrial Applications examines the challenges and current progress towards large scale industrial application of nanofluids summarizing and bringing together varied current research strands and providing potential solutions pertaining to the scientific economic and social barriers that currently exist Opening with an introduction to nanofluid synthesis types and properties this book traverses the potential large scale applications and commercialisation of nanofluids in industrial heating cooling solar energy systems refrigeration systems automotive systems and various chemical processes and manufacturing systems This book provides knowledge of a vast area of applications of nanofluids in industries Thus it also has potential to encourage and trigger the minds of researchers to discover more about nanofluids investigate the gaps overcome the challenges and provide future directions for newer applications and develop nanofluids further The book is written chiefly for graduate postdoc level students and researchers academics teaching or studying in chemical and thermal engineering and who are focused on heat transfer enhancement thermal energy nanofluids and nano enhanced energy systems such as solar thermal systems Examines the challenges and current progress towards implementing large scale industrial application of nanofluids Addresses current gaps in research explores challenges and controversies as well as weaknesses and strengths versus alternative solutions Aims to bridge the gap between fundamental

research and potential industrial scale utilization in the future by providing pathways towards convenient and sustainable scale up Meets a need to compile all current information and knowledge from studies and research related to large scale nanofluids applications in one single resource Multiphase Reactor Engineering for Clean and Low-Carbon Energy Applications Yi Cheng,Fei Wei,Yong Jin,2017-03-13 Provides a comprehensive review on the brand new development of several multiphase reactor techniques applied in energy related processes Explains the fundamentals of multiphase reactors as well as the sophisticated applications Helps the reader to understand the key problems and solutions of clean coal conversion techniques Details the emerging processes for novel refining technology clean coal conversion techniques low cost hydrogen productions and CO2 capture and storage Introduces current energy related processes and links the basic principles of emerging processes to the features of multiphase reactors providing an overview of energy conversion in combination with multiphase reactor engineering Includes case studies of novel reactors to illustrate the special features of these reactors **Laser Additive Manufacturing of Metallic Materials and Components** Dongdong Gu,2022-12-07 Laser Additive Manufacturing of Metallic Materials and Components discusses the current state and future development of laser additive manufacturing technologies detailing material structure process and performance The book explores the fundamental scientific theories and technical principles behind the elements of laser additive manufacturing touching upon scientific and technological challenges faced by laser additive manufacturing technology This book is suitable for those who want to further understand and master laser additive manufacturing technology and will expose readers to innovative industrial applications that meet significant demand from aeronautical and astronautical high end modern industries for low cost short cycle and net shape manufacturing of structure function integrated metallic components With the increasing use of industrial applications additive manufacturing processes are deepening with technology continuing to evolve As new scientific and technological challenges emerge there is a need for an interdisciplinary and comprehensive discussion of material preparation and forming structure design and optimization laser process and its control microstructure and performance characterization and innovative industrial applications hence this book covers these important aspects Highlights an integration of material structure process and performance for laser additive manufacturing of metallic components to reflect the interdisciplinary nature of this technology Covers cross scale structure and performance coordination mechanisms including micro scale material microstructure control meso scale interaction between laser beam and particle matter and macro scale precise forming of components and performance control Explores fundamental scientific theories and technical principles behind laser additive manufacturing processes Provides innovation elements and strategies for the future sustainable development of additive manufacturing technologies in terms of multi materials design novel bio inspired structure design tailored printing process with meso scale monitoring and high performance and functionality of printed components **Energy Research Abstracts** ,1977 Semiannual with semiannual and annual indexes References to

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on industrial and scientific aspects of crystal and layer production The major industrial crystals are treated Si GaAs GaP InP CdTe sapphire oxide and halide scintillator crystals crystals for optical piezoelectric and microwave applications and more Contains 29 contributions from leading crystal technologists covering the following topics General aspects of crystal growth technology Silicon Compound semiconductors Oxides and halides Crystal machining Epitaxy and layer deposition Scientific and technological problems of production and machining of industrial crystals are discussed by top experts most of them from the major growth industries and crystal growth centers In addition it will be useful for the users of crystals for teachers and graduate students in materials sciences in electronic and other functional materials chemical and metallurgical engineering micro and optoelectronics including nanotechnology mechanical engineering and precision machining microtechnology and in solid state sciences **Smart Flow Control Processes in Micro Scale** Bengt Sunden,Jin-yuan Qian,Junhui Zhang ,Zan Wu,2020-12-29 In recent years microfluidic devices with a large surface to volume ratio have witnessed rapid development allowing them to be successfully utilized in many engineering applications A smart control process has been proposed for many years while many new innovations and enabling technologies have been developed for smart flow control especially concerning smart flow control at the microscale This Special Issue aims to highlight the current research trends related to this topic presenting a collection of 33 papers from leading scholars in this field Among these include studies and demonstrations of flow characteristics in pumps or valves as well as dynamic performance in roiling mill systems or jet systems to the optimal design of special components in smart control systems *Materials Processing Fundamentals 2025* Alexandra Anderson,Adrian S. Sabau,Chukwunwike Iloeje,Adamantia Lazou,Kayla M. Molnar,2025-02-19 This collection covers first principle and applied studies of thermodynamics and rate governed phenomena including reaction kinetics and meso macro scale transport of mass momentum and energy throughout the sequence of processing operations Topics represented include but are not limited to Thermodynamic modeling for the optimization of alloy solutions slag compositions and other types of materials Mass and energy balance simulations of material processing systems using software such as FactSage MPE HSC SIM and METSIM Experimental and numerical studies on kinetic rate theories pertaining to crucial material processes such as chemical reactions diffusion nucleation and phase transformations and solidification Numerical modeling and simulation such as computational fluid dynamics CFD of multi scale transport phenomena in unit operations Development and application of process simulations that utilize a combination of thermodynamic kinetic and transport equations to simulate and or control individual unit operations and or plants *New Frontiers in Hybrid Nanofluids for Heat Transfer Process and Applications* Ali Saleh Alshomrani,Safia Akram,2023-07-14

Computational Science and Its Applications – ICCSA 2025 Osvaldo Gervasi,Beniamino Murgante,Chiara Garau,Yeliz Karaca,David Taniar,Ana Maria A. C. Rocha,Bernady O. Apduhan,2025-06-27 T The three volumes LNCS 15648 15649 15650 set constitutes the refereed proceedings of the 25th International Conference on Computational Science and Its Applications

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