

Two Phase Flow Patterns Pressure Drop And Heat Transfer

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Ludwig's Applied Process Design for Chemical and Petrochemical Plants - A. Kayode Coker
2011-08-30

This complete revision of Applied Process Design for Chemical and Petrochemical Plants, Volume 1 builds upon Ernest E. Ludwig's classic text to further enhance its use as a chemical engineering process design manual of methods and proven fundamentals. This new edition includes important supplemental mechanical and related data, nomographs and charts. Also included within are improved techniques and fundamental methodologies, to guide the engineer in designing process equipment and applying chemical processes to properly detailed equipment. All three volumes of Applied Process Design for Chemical and Petrochemical Plants serve the practicing engineer by providing organized design procedures, details on the equipment suitable for application selection, and charts in readily usable form. Process engineers, designers, and operators will find more chemical petrochemical plant design data in: Volume 2, Third Edition, which covers distillation and packed towers as well as material on azeotropes and ideal/non-ideal systems. Volume 3, Third Edition, which covers heat transfer, refrigeration systems, compression surge drums, and mechanical drivers. A. Kayode Coker, is Chairman of Chemical & Process Engineering Technology department at Jubail Industrial College in Saudi Arabia. He's both a chartered scientist and a chartered chemical engineer for more than 15 years. and an author of Fortran Programs for Chemical Process Design, Analysis and Simulation, Gulf Publishing Co., and Modeling of Chemical Kinetics and Reactor Design, Butterworth-Heinemann. Provides improved design manuals for methods and proven fundamentals of process design with related data and charts Covers a complete range of basic day-to-day petrochemical operation topics with new material on significant industry changes since 1995.

Single- and Two-Phase Flow Pressure Drop and Heat Transfer in Tubes - Afshin J. Ghajar 2022-01-11

The book provides design engineers an elemental understanding of the variables that influence pressure drop and heat transfer in plain and micro-fin tubes to thermal systems using liquid single-phase flow in different industrial applications. It also provides design engineers using gas-liquid, two-phase flow in different industrial applications the necessary fundamentals of the two-phase flow variables. The author and his colleagues were the first to determine experimentally the very important relationship between inlet geometry and transition. On the basis of their results, they developed practical and easy to use correlations for the isothermal and non-isothermal friction factor (pressure drop) and heat transfer coefficient (Nusselt number) in the transition region as well as the laminar and turbulent flow regions for different inlet configurations and fin geometry. This work presented herein provides the thermal systems design engineer the necessary design tools. The author further presents a succinct review of the flow patterns, void fraction, pressure drop and non-boiling heat transfer phenomenon and recommends some of the well scrutinized modeling techniques.

Theory of Pressure Drop and Heat Transfer for Two-phase Two-component Annular Flow in Pipes - S. Levy
1951

Two-Phase Flow, Boiling, and Condensation - S. Mostafa Ghiaasiaan 2007-10-22

This text is an introduction to gas-liquid two-phase flow, boiling and condensation for graduate students, professionals, and researchers in mechanical, nuclear, and chemical engineering. The book provides a balanced coverage of two-phase flow and phase change fundamentals, well-established art and science

dealing with conventional systems, and the rapidly developing areas of microchannel flow and heat transfer. It is based on the author's more than 15 years of teaching experience. Instructors teaching multiphase flow have had to rely on a multitude of books and reference materials. This book remedies that problem by covering all the topics essential for a graduate course. Important areas include: two-phase flow model conservation equations and their numerical solution; condensation with and without noncondensables; and two-phase flow, boiling, and condensation in mini and microchannels.

Encyclopedia Of Two-phase Heat Transfer And Flow Iii: Macro And Micro Flow Boiling And Numerical Modeling Fundamentals (A 4-volume Set) - Thome John R 2018-03-13

Set III of this encyclopedia is a new addition to the previous Sets I and II. It contains 26 invited chapters from international specialists on the topics of numerical modeling of two-phase flows and evaporation, fundamentals of evaporation and condensation in microchannels and macrochannels, development and testing of micro two-phase cooling systems for electronics, and various special topics (surface wetting effects, microfin tubes, two-phase flow vibration across tube bundles). The chapters are written both by renowned university researchers and by well-known engineers from leading corporate research laboratories. Numerous 'must read' chapters cover the fundamentals of research and engineering practice on boiling, condensation and two-phase flows, two-phase heat transfer equipment, electronics cooling systems, case studies and so forth. Set III constitutes a 'must have' reference together with Sets I and II for thermal engineering researchers and practitioners.

Two-phase Flow in Pipelines and Heat Exchangers - Duncan Chisholm 1983

Multiphase Science and Technology - G.F. Hewitt 2013-11-11

This is the second volume of Multiphase Science and Technology, a new international series of books intended to provide authoritative overviews of important areas in multiphase systems. The aim is to have systematic and tutorial presentations of the state of knowledge in various areas. The objective of the chapters is to allow the nonspecialist reader to gain an up-to-date idea of the present state of development in a given subject. The response to Volume 1 of the series has been very positive, and we believe that the present volume will be equally well received. Volume 1 was concerned entirely with gas-liquid systems, and the first four chapters of the present volume also relate to such systems. However, the intention of the series is to cover a wide range of multiphase systems, and we are, therefore, pleased to include in the present volume chapters that refer to liquid-liquid and gas-solid multiphase flows, respectively. The first chapter in the present volume is by Professor A. E. Dukler of the University of Houston, Texas, and Professor Y. Taitel of Tel-Aviv University, Israel.

Microgravity Two-phase Flow and Heat Transfer - Kamiel S. Gabriel 2010-11-16

Multiphase thermal systems have numerous applications in aerospace, heat-exchange, transport of contaminants in environmental systems, and energy transport and conversion systems. A reduced - or microgravity - environment provides an excellent tool for accurate study of the flow without the masking effects of gravity. This book presents for the first time a comprehensive coverage of all aspects of two-phase flow behaviour in the virtual absence of gravity.

Measurement of Two Phase Flow Parameters - Geoffrey Frederick Hewitt 1978

Proceedings of the International Field Exploration and Development Conference 2021 - Jia'en Lin 2022

This book focuses on reservoir surveillance and management, reservoir evaluation and dynamic description, reservoir production stimulation and EOR, ultra-tight reservoir, unconventional oil and gas resources technology, oil and gas well production testing, and geomechanics. This book is a compilation of selected papers from the 11th International Field Exploration and Development Conference (IFEDC 2021). The conference not only provides a platform to exchange experience, but also promotes the development of scientific research in oil & gas exploration and production. The main audience for the work includes reservoir engineer, geological engineer, enterprise managers, senior engineers as well as professional students.

Two-phase Flows and Heat Transfer - Sadık Kakaç 1977

Annular Two-Phase Flow - Geoffrey Hewitt 2013-10-22

Annular Two-Phase Flow presents the wide range of industrial applications of annular two-phase flow regimes. This book discusses the fluid dynamics and heat transfer aspects of the flow pattern. Organized into 12 chapters, this book begins with an overview of the classification of the various types of interface distribution observed in practice. This text then examines the various regimes of two-phase flow with emphasis on the regions of occurrence of the annular flow regime. Other chapters consider the single momentum and energy balances, which illustrate the differences and analogies between single- and two-phase flows. This book discusses as well the simple modes for annular flow with consideration to the calculation of the profile of shear stress in the liquid film. The final chapter deals with the techniques that are developed for the measurement of flow pattern, entrainment, and film thickness. This book is a valuable resource for chemical engineers.

Multiphase Flow Handbook - Efstathios Michaelides 2016-10-26

The Multiphase Flow Handbook, Second Edition is a thoroughly updated and reorganized revision of the late Clayton Crowe's work, and provides a detailed look at the basic concepts and the wide range of applications in this important area of thermal/fluids engineering. Revised by the new editors, Efstathios E. (Stathis) Michaelides and John D. Schwarzkopf, the new Second Edition begins with two chapters covering fundamental concepts and methods that pertain to all the types and applications of multiphase flow. The remaining chapters cover the applications and engineering systems that are relevant to all the types of multiphase flow and heat transfer. The twenty-one chapters and several sections of the book include the basic science as well as the contemporary engineering and technological applications of multiphase flow in a comprehensive way that is easy to follow and be understood. The editors created a common set of nomenclature that is used throughout the book, allowing readers to easily compare fundamental theory with currently developing concepts and applications. With contributed chapters from sixty-two leading experts around the world, the Multiphase Flow Handbook, Second Edition is an essential reference for all researchers, academics and engineers working with complex thermal and fluid systems.

Heat Transfer and Fluid Flow in Minichannels and Microchannels - Satish Kandlikar 2013-10-25

Heat exchangers with minichannel and microchannel flow passages are becoming increasingly popular due to their ability to remove large heat fluxes under single-phase and two-phase applications. Heat Transfer and Fluid Flow in Minichannels and Microchannels methodically covers gas, liquid, and electrokinetic flows, as well as flow boiling and condensation, in minichannel and microchannel applications. Examining biomedical applications as well, the book is an ideal reference for anyone involved in the design processes of microchannel flow passages in a heat exchanger. Each chapter is accompanied by a real-life case study. New edition of the first book that solely deals with heat and fluid flow in minichannels and microchannels. Presents findings that are directly useful to designers; researchers can use the information in developing new models or identifying research needs.

Two-phase Pressure Drops - Herbert Stanford Isbin 1954

Pressure drop and flow patterns in the impingement section of an oil-bath air cleaner - Seymour Calvert, Henry J. Hartog, Hadley J. Smith, Robert M. Pease 1955

Heat Transfer, Pressure Drop and Void Fraction in Two-phase, Two-component Flow in a Vertical Tube - Manit Sujumong 1998

Encyclopedia of Two-Phase Heat Transfer and Flow IV - John R Thome 2018-05-18

Set IV is a new addition to the previous Sets I, II and III. It contains 23 invited chapters from international specialists on the topics of numerical modeling of pulsating heat pipes and of slug flows with evaporation; lattice Boltzmann modeling of pool boiling; fundamentals of boiling in microchannels and microfin tubes, CO₂ and nanofluids; testing and modeling of micro-two-phase cooling systems for electronics; and various special topics (flow separation in microfluidics, two-phase sensors, wetting of anisotropic surfaces, ultra-compact heat exchangers, etc.). The invited authors are leading university researchers and well-known engineers from leading corporate research laboratories (ABB, IBM, Nokia Bell Labs). Numerous 'must read' chapters are also included here for the two-phase community. Set IV constitutes a 'must have' engineering and research reference together with previous Sets I, II and III for thermal engineering researchers and practitioners.

Two-phase flow in an unheated and heated tube - Jan Jozef Kowalczewski 1964

Heat Transfer and Pressure Drop During Two-phase Two-component Flow in a Horizontal Tube - Abdel-Hamid Aly Abou Sabe 1951

Two-Phase Flow in Complex Systems - Salomon Levy 1999-08-02

The first comprehensive, real-world look at two-phase flow systems—from one of the world's leading authorities on the subject. From his early works in the area of heat transfer research on boundary layer flows and two-phase flows to his role as one of the lead consultants following the Three Mile Island accident, internationally renowned engineer Salomon Levy has achieved an ideal balance of theory and practice in his engineering career. In *Two-Phase Flow in Complex Systems*, Dr. Levy's newest book, he draws on this breadth of experience to examine these systems in the real world. *Two-Phase Flow in Complex Systems* offers a unique look at two-phase flow phenomena (primarily gas and liquid) in a variety of systems, from water reactors to the global climate system. Focusing on the interaction and simultaneous behavior of all the components in a system, the book's approach departs significantly from conventional texts, which emphasize modeling of separate phenomena. The book begins with the formulation of an integrated program of experiments and analytical tools, and describes experimental aspects—specifically the scaling of test facilities—essential to representing the critical elements of the behavior of complex systems. Subsequent chapters: * Discuss system computer codes for predicting system behavior during transients and accidents. * Examine flow pattern maps and flow pattern models. * Describe typical limiting phenomena known to impact the safety and cost of complex systems (including countercurrent limiting conditions and critical or choking flow). The book also illustrates how the analysis used in understanding the dynamics of a nuclear power system can be applied to the entire global climate system, including the phenomenon of global warming.

Transport Phenomena in Multiphase Systems - Amir Faghri 2006

Transport phenomena are the physical forces and processes by which energy and mass are moved into, out of, and throughout a system. Systems that are changing from one state (phase) to another, such as liquid to gas, are said to be "multiphase." This advanced text, for the first time, teaches the fundamentals of transport phenomena, including the relevant thermodynamics and kinetics, in the context of multiphase systems. Students will find this an accessible guide to the understanding of an often dauntingly complex subject, with ample worked-out examples taken from real-life engineering problems and helpful end-of-chapter problems to help reinforce abstract concepts. *Develops and understanding of the thermal and physical behavior of multiphase systems *Reviews underlying thermodynamics, including thermal equilibria and stability, thermodynamics of surfaces *Covers all types of phase changes, including melting and solidification, sublimation and vapor deposition, boiling, condensation, and evaporation *Ample end-of-chapter problems *Solutions Manual

Handbook of Single-Phase Convective Heat Transfer - Sadık Kakaç 1987-11-03

Very Good, No Highlights or Markup, all pages are intact.

Flow Boiling in Expanding Microchannels - Tamanna Alam 2017-06-07

This Brief presents an up to date summary of details of the flow boiling heat transfer, pressure drop and instability characteristics; two phase flow patterns of expanding microchannels. Results obtained from the different expanding microscale geometries are presented for comparison and addition to that, comparison with literatures is also performed. Finally, parametric studies are performed and presented in the brief. The findings from this study could help in understanding the complex microscale flow boiling behavior and aid in the design and implementation of reliable compact heat sinks for practical applications.

Convective Boiling and Condensation - John G. Collier 1994-05-19

* Third edition of a well-known and well established text both in industry and for teaching * Fully up-to-date and includes extra problems This book is an aid to heat exchanger design written primarily for design and development engineers in the chemical process, power generation, and refrigeration industries. It provides a comprehensive reference on two-phase flows, boiling, and condensation. The text covers all the latest advances like flows over tube bundles and two-phase heat transfer regarding refrigerants and petrochemicals. Another feature of this third edition is many new problems at chapter ends to enhance its use as a teaching text for graduate and post-graduate courses on two-phase flow and heat transfer. - ; This book is written for practising engineers as a comprehensive reference on two-phase flows, boiling, and condensation. It deals with methods for estimating two-phase flow pressure drops and heat transfer rates. It is a well-known reference book in its third edition and is also used as a text for advanced university courses. Both authors write from practical experience as both are professional engineers. -

Heat Transfer and Pressure Drop Accompanying Two Component Flow of Fluids Through Pipes - Robert William Ravenscroft 1943

Flow boiling and condensation in microscale channels - Fabio Toshio Kanizawa 2021-04-30

This book covers aspects of multiphase flow and heat transfer during phase change processes, focusing on boiling and condensation in microscale channels. The authors present up-to-date predictive methods for flow pattern, void fraction, pressure drop, heat transfer coefficient and critical heat flux, pointing out the range of operational conditions that each method is valid. The first four chapters are dedicated on the motivation to study multiphase flow and heat transfer during phase change process, and the three last chapters are focused on the analysis of heat transfer process during boiling and condensation. During the description of the models and predictive methods, the trends are discussed and compared with experimental findings.

Two-phase, Steam-water, Pressure Drops - Donald Raymond Mosher 1954

Frontiers and Progress in Multiphase Flow I - Lixin Cheng 2014-04-09

This volume presents state-of-the-art of reviews in the field of multiphase flow. It focuses on nonlinear aspects of multiphase flow networks as well as visualization experiments. The first chapter presents nonlinear aspects or deterministic chaos issues in the systems of multi-phase reactors. The second chapter reviews two-phase flow dynamics in combination with complex network theory. The third chapter discusses evaporation mechanism in the wick of copper heat pipes. The last chapter investigates numerically the flow dynamics and heat and mass transfer in the laminar and turbulent boundary layer on the flat vertical plate. *Two-Phase Gas-Liquid Flow in Pipes with Different Orientations* - Afshin J. Ghajar 2020-03-14

This book provides design engineers using gas-liquid two-phase flow in different industrial applications the necessary fundamental understanding of the two-phase flow variables. Two-phase flow literature reports a plethora of correlations for determination of flow patterns, void fraction, two-phase pressure drop and non-boiling heat transfer correlations. However, the validity of a majority of these correlations is restricted over a narrow range of two-phase flow conditions. Consequently, it is quite a challenging task for the end user to select an appropriate correlation/model for the type of two-phase flow under consideration. Selection of a correct correlation also requires some fundamental understanding of the two-phase flow physics and the underlying principles/assumptions/limitations associated with these correlations. Thus, it is of significant interest for a design engineer to have knowledge of the flow patterns and their transitions and their

influence on two-phase flow variables. To address some of these issues and facilitate selection of appropriate two-phase flow models, this volume presents a succinct review of the flow patterns, void fraction, pressure drop and non-boiling heat transfer phenomenon and recommend some of the well scrutinized modeling techniques.

Fuzzy Information and Engineering Volume 2 - Bingyuan Cao 2009-10-14

This book is the proceedings of the Third International Conference on Fuzzy Information and Engineering (ICFIE 2009) held in the famous mountain city Chongqing in Southwestern China, from September 26-29, 2009. Only high-quality papers are included. The ICFIE 2009, built on the success of previous conferences, the ICFIE 2007 (Guangzhou, China), is a major symposium for scientists, engineers and practitioners in the world to present their updated results, ideas, developments and applications in all areas of fuzzy information and engineering. It aims to strengthen relations between industry research laboratories and universities, and to create a primary symposium for world scientists in fuzzy fields as follows: Fuzzy Information; Fuzzy Sets and Systems; Soft Computing; Fuzzy Engineering; Fuzzy Operation Research and Management; Artificial Intelligence; Fuzzy Mathematics and Systems in Applications, etc.

Encyclopedia Of Two-phase Heat Transfer And Flow II: Special Topics And Applications (A 4-volume Set) - Thome John R 2015-08-26

The aim of the two-set series is to present a very detailed and up-to-date reference for researchers and practicing engineers in the fields of mechanical, refrigeration, chemical, nuclear and electronics engineering on the important topic of two-phase heat transfer and two-phase flow. The scope of the first set of 4 volumes presents the fundamentals of the two-phase flows and heat transfer mechanisms, and describes in detail the most important prediction methods, while the scope of the second set of 4 volumes presents numerous special topics and numerous applications, also including numerical simulation methods. Practicing engineers will find extensive coverage to applications involving: multi-microchannel evaporator cold plates for electronics cooling, boiling on enhanced tubes and tube bundles, flow pattern based methods for predicting boiling and condensation inside horizontal tubes, pressure drop methods for singularities (U-bends and contractions), boiling in multiport tubes, and boiling and condensation in plate heat exchangers. All of these chapters include the latest methods for predicting not only local heat transfer coefficients but also pressure drops. Professors and students will find this 'Encyclopedia of Two-Phase Heat Transfer and Flow' particularly exciting, as it contains authored books and thorough state-of-the-art reviews on many basic and special topics, such as numerical modeling of two-phase heat transfer and adiabatic bubbly and slug flows, the unified annular flow boiling model, flow pattern maps, condensation and boiling theories, new emerging topics, etc.

Fundamentals of Multiphase Flow - C. E. Brennen 2005-04-18

Publisher Description

Fluid Flow, Heat Transfer and Boiling in Micro-Channels - L. P. Yarin 2008-09-19

The subject of the book is fluid dynamics and heat transfer in micro-channels. This problem is important for understanding the complex phenomena associated with single- and two-phase flows in heated micro-channels. The challenge posed by high heat fluxes in electronic chips makes thermal management a key factor in the development of these systems. Cooling of micro-electronic components by new cooling technologies, as well as improvement of the existing ones, is becoming a necessity as the power dissipation levels of integrated circuits increases and their sizes decrease. Miniature heat sinks with liquid flows in silicon wafers could significantly improve the performance and reliability of semiconductor devices. The improvements are made by increasing the effective thermal conductivity, by reducing the temperature gradient across the wafer, by reducing the maximum wafer temperature, and also by reducing the number and intensity of localized hot spots. A possible way to enhance heat transfer in systems with high power density is to change the phase in the micro-channels embedded in the device. This has motivated a number of theoretical and experimental investigations covering various aspects of heat transfer in micro-channel heat sinks with phase change. The flow and heat transfer in heated micro-channels are accompanied by a number of thermohydrodynamic processes, such as liquid heating and vaporization, boiling, formation of two-phase mixtures with a very complicated inner structure, etc., which affect significantly the hydrodynamic and thermal characteristics of the cooling systems.

Flow Patterns of Two-phase Flow - John H. Vohr 1960

Encyclopedia Of Two-phase Heat Transfer And Flow I: Fundamentals And Methods (A 4-volume Set) - Thome John R 2015-08-14

The aim of the two-set series is to present a very detailed and up-to-date reference for researchers and practicing engineers in the fields of mechanical, refrigeration, chemical, nuclear and electronics engineering on the important topic of two-phase heat transfer and two-phase flow. The scope of the first set of 4 volumes presents the fundamentals of the two-phase flows and heat transfer mechanisms, and describes in detail the most important prediction methods, while the scope of the second set of 4 volumes presents numerous special topics and numerous applications, also including numerical simulation methods. Practicing engineers will find extensive coverage to applications involving: multi-microchannel evaporator cold plates for electronics cooling, boiling on enhanced tubes and tube bundles, flow pattern based methods for predicting boiling and condensation inside horizontal tubes, pressure drop methods for singularities (U-bends and contractions), boiling in multiport tubes, and boiling and condensation in plate heat exchangers. All of these chapters include the latest methods for predicting not only local heat transfer coefficients but also pressure drops. Professors and students will find this 'Encyclopedia of Two-Phase Heat Transfer and Flow' particularly exciting, as it contains authored books and thorough state-of-the-art reviews on many basic and special topics, such as numerical modeling of two-phase heat transfer and adiabatic bubbly and slug flows, the unified annular flow boiling model, flow pattern maps, condensation and boiling theories, new emerging topics, etc.

Boiling Heat Transfer And Two-Phase Flow - L S Tong 2018-05-04

Completely updated, this graduate text describes the current state of boiling heat transfer and two-phase flow, in terms through which students can attain a consistent understanding. Prediction of real or potential boiling heat transfer behaviour, both in steady and transient states, is covered to aid engineering design of reliable and effective systems.

Single-phase, Two-phase and Supercritical Natural Circulation Systems - Pallippattu Krishnan Vijayan 2019-06-19

Single-Phase, Two-Phase and Supercritical Natural Circulation Systems provides readers with a deep understanding of natural circulation systems. This book equips the reader with an understanding on how to

detect unstable loops to ensure plant safety and reliability, calculate heat transport capabilities, and design effective natural circulation loops, stability maps and parallel channel systems. Each chapter begins with an introduction to the circulation system before discussing each element in detail and analyzing its effect on the performance of the system. The book also presents thermosyphon heat transport devices in nuclear and other industrial plants, a common information need for students and researchers alike. This book is invaluable for engineers, designers, operators and consultants in nuclear, mechanical, electrical and chemical disciplines. Presents single-phase, two-phase and supercritical natural circulation systems together in one resource to fill an existing knowledge gap. Guides the reader through relevant processes, such as designing, analyzing and generating stability maps and natural circulation loops, calculating heat transport capabilities, and maintaining natural circulation system operations. Includes global case studies and examples to increase understanding, along with important IAEA standards and procedures.

Pressure Drops in Two-phase Flow - Keith Charles Eddy 1954

Encyclopedia of Two-phase Heat Transfer and Flow - John R. Thome 2016

The aim of the two-set series is to present a very detailed and up-to-date reference for researchers and practicing engineers in the fields of mechanical, refrigeration, chemical, nuclear and electronics engineering on the important topic of two-phase heat transfer and two-phase flow. The scope of the first set of 4 volumes presents the fundamentals of the two-phase flows and heat transfer mechanisms, and describes in detail the most important prediction methods, while the scope of the second set of 4 volumes presents numerous special topics and numerous applications, also including numerical simulation methods. Practicing engineers will find extensive coverage to applications involving: multi-microchannel evaporator cold plates for electronics cooling, boiling on enhanced tubes and tube bundles, flow pattern based methods for predicting boiling and condensation inside horizontal tubes, pressure drop methods for singularities (U-bends and contractions), boiling in multiport tubes, and boiling and condensation in plate heat exchangers. All of these chapters include the latest methods for predicting not only local heat transfer coefficients but also pressure drops. Professors and students will find this 'Encyclopedia of Two-Phase Heat Transfer and Flow' particularly exciting, as it contains authored books and thorough state-of-the-art reviews on many basic and special topics, such as numerical modeling of two-phase heat transfer and adiabatic bubbly and slug flows, the unified annular flow boiling model, flow pattern maps, condensation and boiling theories, new emerging topics, etc.