

<<微细沸腾传递现象>>

图书基本信息

书名：<<微细沸腾传递现象>>

13位ISBN编号：9787302223559

10位ISBN编号：7302223556

出版时间：2010-7

出版时间：彭晓峰 清华大学出版社 (2010-07出版)

作者：彭晓峰

页数：255

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：<http://www.tushu007.com>

前言

This book is based on the excellent fundamental research of Prof. X. F. Peng. Many unique micro transport phenomena during boiling with their corresponding mechanisms have been investigated. This will serve as a special reference for researchers interested in the field of microscale boiling. Boiling exists widely in the natural world, with boiling heat transfer has been employed in many practical applications. However, due to the highly nonequilibrium and coupled driven effects of the various physical potential, boiling heat and mass transfer is extremely complicated and many interesting phenomena are triggered under different specified conditions. Nowadays, the rapid development of practical engineering applications of boiling in cooling of electronic devices, thermal management of aerospace and micro energy systems, and micro-manufacturing, promote a strong demand for better understanding of microscale transport phenomena and create a notable shift of thermal science and heat transfer research from macroscale to microscale. Consequently, in recent decades, more and more investigations have been conducted to explore the micro transport phenomena during boiling. This book reviews and summarizes the new achievements and contributions of recent investigations, including the outstanding fundamental research conducted by the writer and his co-authors. The fundamentals for conducting investigations on micro boiling, microscale boiling and transport phenomena, boiling characteristics at microscale, and some important applications of micro boiling transport phenomena are introduced and discussed. Chapter 1 introduces the background and industrial applications, as well as the research history of boiling, and then, the critical concept of "micro boiling" is described. In Chapter 2, some important thermal physics concepts and principles involved in boiling phenomena, such as phase and phase equilibrium, phase transition, interracial aspects, contact angle and dynamical contact behavior, and cluster dynamics are described in detail. Chapter 3 introduces new understandings of boiling nucleation and achievements in the latest 20 years.

<<微细沸腾传递现象>>

内容概要

作为热流体工程科学中最具挑战性的研究课题之一，沸腾现象在微型能源系统、微电子和发光二极管冷却、高密度紧凑式装置或系统、高热流密度散热和热管理等方面的应用，以及沸腾现象的复杂性和多样性一直受到高度关注，其物理本质的研究因而成为一大热点。

《微细沸腾传递现象》从微细尺度沸腾研究基础理论、沸腾的微尺度特征和理论、微尺度沸腾与传递现象的描述、微尺度沸腾传递的应用几个侧面分析这一领域的最新进展，系统地描述了这一现象并给出了基础理论的框架。

《微细沸腾传递现象》可供大学和科研院所力学、热物理、能源、微电子等专业的研究人员和本科高年级学生、研究生阅读参考。

<<微细沸腾传递现象>>

作者简介

Dr. Xiaofeng Peng, who had passed away on Sep. 10, 2008, was a professor at the Department of Thermal Engineering, Tsinghua University, China.

<<微细沸腾传递现象>>

书籍目录

Introduction1.1 Critical Technology1.2 History and Trends of Boiling.1.3 Micro BoilingReferencesThermal Physical Fundamentals2.1 Phase and Phase Equilibrium..2.2 Phase Transition2.3 Interfacial Aspects2.4 Contact Angle and Dynamical Contact Behavior2.4.1 Contact Angle at Equilibrium2.4.2 Contact Angle Hysteresis2.4.3 Dynamical Contact Angle2.5 Cluster Dynamics2.5.1 Clusters2.5.2 Number Balance of Activated Molecules in a Cluster.2.5.3 Cluster Evolution with Internal Perturbations2.5.4 Cluster Evolution with External PerturbationsReferences3 Boiling Nucleation3.1 Nucleus Formation3.1.1 Mean Free Path3.1.2 Self-Aggregation3.1.3 Aggregate Formation3.1.4 Critical Aggregation Concentration3.1.5 Infinite Aggregation Formation3.1.6 Physical Configuration of Nucleus Formation3.2 Interfacial Effects on Nucleation3.2.1 Nucleus Structure Evolution3.2.2 Interfacial Tension of a Nucleus3.2.3 Modification of Nucleation Rate3.3 Microscope Activation near a Flat Surface3.3.1 Liquid Behavior near a Heated Wall3.3.2 Nucleation Position3.3.3 Embryo Bubble Evolution3.4 Bubble Evolution from a Cavity3.4.1 Description of Heterogeneous Nucleation3.4.2 Nucleation with One Barrier3.4.3 Heterogeneous Nucleation with Two Barriers ..ReferencesJet Flow Phenomena4.1 Experimental Phenomena4.1.1 Boiling on a Plate Heater4.1.2 Boiling on Small Wires4.2 Bubble-Top Jet Flow Structure4.2.1 General Features4.2.2 Jet Structure4.2.3 Multi Bubble-Top Jet Flow4.3 Dynamical Behavior of Bubble-Top Jet Flows4.3.1 Jet Flow Evolution4.3.2 Competition and Self-Organization of Jet Flows4.4 Models of Bubble-Top Jet Flow4.4.1 Governing Equations4.4.2 Fundamental Considerations4.5 Characteristics of Bubble-Top Jet Flow4.5.1 Jet Flow Driving Force and Pumping Effect4.5.2 Jet Flow Bifurcation Phenomenon4.6 Formation of Bubble-Top Jet Flow.,4.6.1 Temperature Evolution4.6.2 Temperature Evolution on Bubble Interface4.6.3 Flow EvolutionReferencesBubble Dynamics on Fine Wires5.1 Modes of Bubble Motion5.1.1 Bubble Sweeping5.1.2 Bubble Interaction5.1.3 Bubble Oscillation Phenomena5.1.4 Bubble Leaping5.2 Fundamentals of Bubble Dynamics5.2.1 Thermocapillary Force5.2.2 Force Caused by Bubble Motion5.2.3 Dynamic Equation5.3 Bubble Sweeping Dynamics5.3.1 Single Bubble Sweeping5.3.2 Bubble Separation from an Immobile Bubble5.3.3 Separation of Two Equivalent Moving Bubbles5.3.4 Separation of Two Non-Equivalent Bubbles5.4 Bubble Collision Dynamics5.4.1 Collision with an Immobile Bubble5.4.2 Collision of Two Equivalent Bubbles5.4.3 Bubble Coalescence5.5 Bubble Oscillation5.5.1 Temperature Profile of a Two Immobile Bubbles System5.5.2 Bubble Oscillation Characteristics5.5.3 Bubble Oscillations with Various Effective Viscosities ...5.5.4 Coupling Bubble Oscillation5.6 Bubble Leaping Dynamics5.6.1 Dynamical Description5.6.2 Simple Leaping Dynamics5.6.3 Heat Transfer Performance during Bubble Leaping and SweepingReferences6 Boiling in Microchannels6.1 Experimental Observations6.1.1 General Behavior6.1.2 Nucleation Superheat6.1.3 Experimental Phenomena6.2 Physical Explanation6.2.1 Evaporating Space and Fictitious Boiling6.2.2 Thermodynamic Evidence6.2.3 Cluster Dynamical Evidence6.3 Nucleation Criterion6.3.1 Thermodynamic Analysis6.3.2 Statistical Mechanics Approach6.3.3 Dynamic Model6.4 Nucleation Kinetics6.4.1 Bubble Evolution Dynamics near Critical Radius..6.4.2 Nucleation in Confined Space6.5 Bubble Dynamic Behavior with Local Heating6.5.1 Experiments6.5.2 Phase Change Behavior6.6 Interface Oscillation6.6.1 Periodic Feature6.6.2 Evaporating Interface..6.6.3 Condensing Interface ..ReferencesBoiling in Droplets7.1 Oscillation of Sessile Droplets7.1.1 Experimental Observations7.1.2 Oscillatory Behavior7.1.3 Physical Understanding7.2 Model of Droplet Oscillation7.2.1 Physical Model7.2.2 Flow Characteristics7.3 Transitional Boiling Behavior7.3.1 Experimental Description7.3.2 Restricted Cyclical Phase Change7.3.3 Single-Bubble Cyclical Phase Change7.3.4 Metastable Cyclical Phase Change7.4 Droplet Spreading During Evaporation and Nucleation.7.4.1 Phenomenon Observations7.4.2 Influential Factors7.4.3 Spread Area and Spread Speed7.4.4 Heat FluxesReferencesBoiling in Micro-Structures and Porous Media8.1 Experimental Observations8.1.1 Test Apparatus8.1.2 Low Applied Heat Flux8.1.3 Moderate Applied Heat Flux8.1.4 High Applied Heat Flux8.2 Bubble Behavior in Bead-Packed Structure8.2.1 Boiling Process8.2.2 Static Description of Primary Bubble Interface8.2.3 Comparison of Results8.3 Replenishment and Dynamic Behavior of Interface8.3.1 Replenishing Liquid Flow8.3.2 Dynamic Behavior of Bubble Interface8.3.3 Interfacial Heat and Mass Transfer at Pore-Level...8.4 Pore-Scale Bubble Dynamics8.4.1

<<微细沸腾传递现象>>

Introduction 8.4.2 Discrete Rising Bubble 8.4.3 Bubble Departure Interference.....

<<微细沸腾传递现象>>

章节摘录

插图：A locally heated duct liquid flow usually has a fully-developed velocity profile and a developing thermal boundary, which could therefore be categorized as the thermal entrance problem, or the Graetz-type problem. [34] When heat flux within heated region increased to a value so that both fluid temperature and thermal layer thickness favored nucleation condition at some active locations, nucleate boiling began as shown in Fig. 6.15(a). From classical bubble dynamics theory, initial period of bubble growth should be inertia-controlled, shown bi-directional bubble growth along both the upstream and downstream direction to satisfy the pressure balance. Since the bubble was confined by small channel width, it was an elongated bubble or vapor column. The length of the elongated bubble increased until the pressure difference across the liquid-vapor phase interface reduced, and the interface movement decelerated. Then the bubble growth entered the heat transfer controlled period. In heat transfer control period, the upstream cap of the elongated bubble evaporated due to continuous heating from the channel wall. And highly energetic vapor generation pushed both the upper and lower caps moving further upstream and downstream, respectively. As the upper interface moved upwards into upstream subcooled liquid and even out of heating region, the interfacial temperature or liquid superheat for inducing evaporation would decrease, and the evaporation rate slowed. Finally the upstream cap stopped moving, as depicted in Fig. 6.15(b). The downstream cap of the bubble, on the other hand, left the locally heated region during its movement downwards, and superheated vapor started to condense on the relatively low temperature surface of the upper channel wall, or the Pyrex glass layer bottom (see Fig. 6.15(c)). Condensation continued until vapor was entirely consumed, and liquid single phase flow recurred.

<<微细沸腾传递现象>>

编辑推荐

《微细沸腾传递现象》：Micro Transport Phenomena Duritzg Boiling reviews the new achievements and contributions in recent investigations at microscale, the content mainly includes (i) fundamentals for conducting investigations of micro boiling, (ii) microscale boiling and transport phenomena, (iii) boiling characteristics at microscale, (iv) some important applications of micro boiling transport phenomena. This book is intended for researchers and engineers in the field of micro energy systems, electronic cooling, and thermal management in various compact devices/systems at high heat removal and/or heat dissipation.

<<微细沸腾传递现象>>

版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:<http://www.tushu007.com>