

Contents

<i>Contributors</i>	<i>ix</i>
<i>Preface</i>	<i>xi</i>
<i>Acknowledgments</i>	<i>xiii</i>

VOLUME 1

Survey of Boiling Phenomena	<i>Sjoerd van Stralen</i>	1
------------------------------------	---------------------------	----------

I INTRODUCTION

1 Heat Transfer to Boiling Pure Liquids	<i>Sjoerd van Stralen</i>	17
2 Heat Transfer to Boiling Binary and Ternary Systems	<i>Sjoerd van Stralen</i>	33

II NUCLEATION

3 Homogeneous and Heterogeneous Nucleation	<i>Robert Cole</i>	71
4 Experimental Techniques and Superheat-Limit Explosions	<i>Robert Cole</i>	89
5 Boiling Nucleation	<i>Robert Cole</i>	113

III NUCLEATE BOILING

6 Nucleate-Boiling Heat Transfer, a General Survey	<i>Robert Cole</i>	155
---	--------------------	------------

IV BEHAVIOR OF FREE BUBBLES DURING GROWTH AND IMPLOSION IN INITIALLY UNIFORM PURE AND BINARY SYSTEMS

7 Growth Rate of Vapor and Gas Bubbles	<i>Sjoerd van Stralen</i>	197
8 Combined Effects of Inertia and Diffusion	<i>Wout Zijl, David Moalem Maron, and Sjoerd van Stralen</i>	273

V HEAT AND MASS TRANSFER WITH CHANGE OF PHASE AT THE WALL

- 9 The Mechanism of Nucleate Boiling in Pure and Binary Systems**
Sjoerd van Stralen 293
 9.1 Physical Background 293
 9.2 Theory and Experiment 311
- 10 Combined Effects of Heater Geometry and Coaxial Tubes on Peak Flux in Saturated and Local Boiling of Pure and Binary Systems**
Sjoerd van Stralen and Pim Sluyter 339
- 11 Topics Related to Nucleate Boiling: Skim Milk, Hysteresis, Fouling, Droplet Evaporation, Condensation of Supersaturated Vapor, Cryogenics, and Ultrasonics** *Sjoerd van Stralen* 375
- 12 Nucleate Boiling at a Liquid-Liquid Interface** *David Moalem Maron, Wout Zijl, and Sjoerd van Stralen* 391
- ## VI ELECTROLYSIS
- 13 Gas Evolution during Electrolysis**
 13.1 Bubble Growth and Gas Production *Sjoerd van Stralen, Reinoud de Jonge, and Harry Verhaart* 413
 13.2 Mass Transfer at Gas-Evolving Electrodes *L. J. J. Janssen* 436
- Addenda to Chapters 7–9** *Sjoerd van Stralen* A-1
Addenda to Section 4 of Chapter 13.1 *Sjoerd van Stralen and Harry Verhaart* A-5
Addenda to Chapter 13
 13.3 Bubble Behavior during Water Electrolysis *Peter Sillen* A-7
 13.4 Effect of Bubbles on Cell Performance *Peter Sillen* A-11

Index I-1

VOLUME 2

VII BUBBLE GROWTH RATES IN NUCLEATE BOILING AT SUBATMOSPHERIC PRESSURES

- 14 The Evaporation Microlayer in Pure Systems** *Sjoerd van Stralen* 447
- 15 Combined Effect of Relaxation and Evaporation Microlayers**
Sjoerd van Stralen 467
- 16 Saturated Boiling in Binary Systems, Liquid Metals, and Local Boiling**
Sjoerd van Stralen 503

VIII THERMODYNAMICS

- 17 Some Thermodynamic Relations for Binary Liquid-Gas Equilibria**
H. N. Stein 535

IX BUBBLE HYDRODYNAMICS

- 18 Application of Numerical Approximation Methods to the Hydrodynamics of Vapor and Gas Bubbles** *Wout Zijl* 557

X FILM AND TRANSITION BOILING

- 19 Film Boiling in Pure and Binary Systems** *Sjoerd van Stralen* 615
19.1 Physical Background and Theoretical Models 615
19.2 Experimental Results Compared to the Hydrodynamic Instability Theory 630
- 20 Boiling Stability during Pool Boiling on Wires or Tubes at Constant Pressure** *Niels Madsen* 657

XI TWO-PHASE FLOW BOILING

- 21 Effect of Vapor-Bubble Behavior on Heat Transfer in Two-Phase Flow Boiling of Pure and Binary Systems** *Sjoerd van Stralen* 669
21.1 Survey and Theoretical Background 669
21.2 Theory: Diffusion Model 685
21.3 Theory: Rayleigh Model 713
21.4 Experimental Data Compared to Theory 734
- 22 Heat Transfer and Fluid Flow in Two-Phase Cooling Systems** *M. Bogaardt and S. B. van der Molen* 779

XII FUNDAMENTAL INVESTIGATIONS ON NUCLEATE BOILING

- 23 Nucleate Boiling in Thin Liquid Films** *Russell Mesler* 813
- 24 Interferometry and Holography in Nucleate Boiling** *H. Beer* 821
- 25 Interactions in Multiple Bubbles: Transport in Single Bubble Trains and Bubble Swarms** *David Moalem Maron* 845
- 26 Bubble Sizes in Nucleate Pool Boiling** *A. K. Chesters* 879

XIII APPLICATIONS

- 27 Evaporation and Condensation of Films in Water Desalination Units**
Samuel Sideman and David Moalem Maron 903
- 28 Heat Pipes** *C. J. Hoogendoorn* 923
- 29 Some Boiling Aspects in Kettle Evaporators** *G. H. Niels* 937