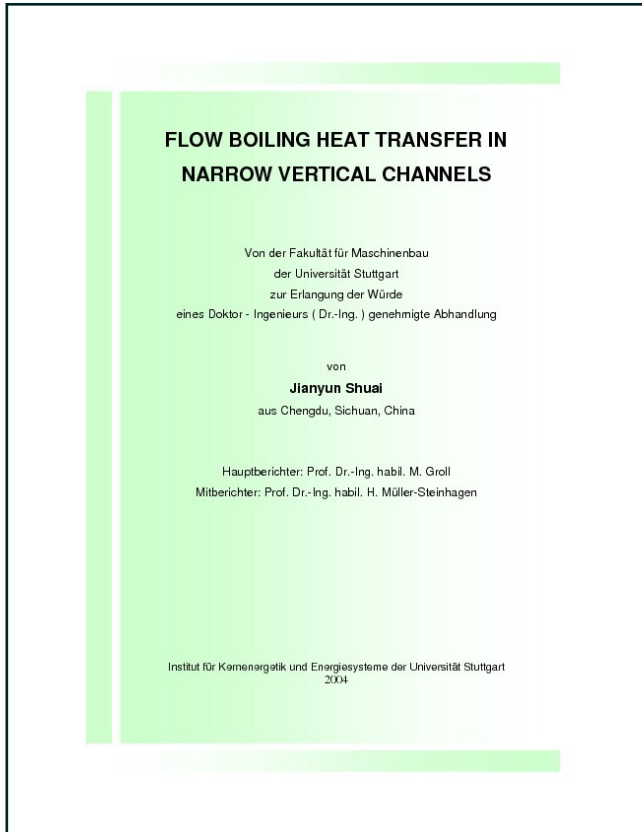




Jianyun Shuai (Autor)
Flow Boiling Heat Transfer in Narrow Vertical Channels



<https://cuvillier.de/de/shop/publications/2801>

Copyright:
Cuvillier Verlag, Inhaberin Annette Jentsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,
Germany
Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>

Contents

Acknowledgments	
Abstract	
Nomenclature	
Chapter 1: Introduction	1
1.1 Background	1
1.2 Classification of Narrow Channels	2
1.3 Size Effect	3
1.4 Investigation Objectives	3
Chapter 2: Experimental System and Error Analysis	4
2.1 Experimental Set-up	4
2.2 Experimental Uncertainty Analysis	8
2.2.1 Error Estimation of Directly Measured Parameters	8
2.2.2 Combined Uncertainties for Indirectly Measured Parameters	9
2.2.2.1 Heat loss estimation	9
2.2.2.2 Error evaluation for some basic parameters	11
Chapter 3: Single-Phase Flow and Heat Transfer	13
3.1 Simplification of Thermal Boundary Conditions	13
3.2 Flow and Heat Transfer Models	14
3.2.1 Circular Tubes	14
3.2.2 Rectangular Channels	16
3.2.3 Partial Peripherally Heated Channels	18
3.3 Review on Single-phase Flow and Heat Transfer in Narrow Channels	18
3.4 Experimental Results and Discussion	19
3.4.1 Friction Factor for Adiabatic Flow	19
3.4.2 Results for Diabatic Flow	21
3.4.2.1 Data reduction	21
3.4.2.2 Friction factor	22
3.4.2.3 Nusselt number	25
3.5 Summary	29

Chapter 4: Flow Visualization and Flow Patterns	30
4.1 Introduction to Two-phase Flow Regimes	30
4.1.1 Flow Pattern Classification in Vertical Pipes	30
4.1.2 Flow Pattern Maps	31
4.1.3 Flow Patterns in Narrow Channels	33
4.2 Experiments	33
4.2.1 Flow Visualization	33
4.2.2 Flow Pattern Maps	36
4.2.2.1 Generation of flow pattern maps	36
4.2.2.2 Experimental flow pattern maps	40
4.2.2.3 Comparison with existing theories	42
4.2.2.4 Discussion	46
4.3 Summary	47
Chapter 5: Flow Boiling Heat Transfer	48
5.1 Previous Investigations	48
5.1.1 Regimes of Heat Transfer during Flow Boiling in Normal-sized Channels	48
5.1.2 Existing Heat Transfer Correlations for Saturated Flow Boiling	50
5.1.3 Flow Boiling Heat Transfer in Narrow Channels	53
5.1.4 Heat Transfer Models for Narrow Channels	54
5.2 Modification of Existing Correlations	54
5.3 Data Reduction	55
5.4 Experimental Results and Discussion	56
5.4.1 The 2.0×4.0 mm ² Channel	56
5.4.1.1 Experimental results	56
5.4.1.2 Comparison with correlations	61
5.4.2 The 0.86×2.0 mm ² Channel	64
5.4.2.1 Experimental results	64
5.4.2.2 Comparison with correlations	68
5.4.3 The 0.54×1.60 mm ² Channel	71
5.4.3.1 Experimental results	71
5.4.3.2 Comparison with correlations	75
5.4.4 Summary	79
5.5 Developing New Correlations	79
5.6 Discussion	85
Chapter 6: Conclusions	87
Appendix A: Summary of Experimental Investigations for Narrow Channels	90

Appendix B: Comparison of Experimental Flow Boiling Heat Transfer Data with Correlations	97
Appendix C: Pressure Drop during Flow Boiling in Narrow Channels	107
References	114