

Contents

1	Introduction	1
1.1	Configurations of Impinging Jets	2
	References	5
2	Mathematical Modeling of Turbulence in Porous Media	7
2.1	Local Instantaneous Transport Equations	7
2.2	Double-Decomposition of Variables	8
2.3	Macroscopic Flow Equations	8
2.4	One-Energy Equation Model	10
2.5	Two-Energy Equation Model	13
2.5.1	Turbulence	15
2.5.2	Interfacial Heat Transfer, h_i	16
2.5.3	Non-Dimensional Parameters	16
2.6	Boundary Conditions and Numerical Details	17
2.6.1	Flow Boundary and Interface Conditions	17
2.6.2	Heat Boundary and Interface Conditions	17
2.6.3	Numerical Details	18
	References	18
3	Flow Structure of Impinging Jets	21
3.1	Clear Chamber	22
3.1.1	Mean Flow	22
3.1.2	Turbulent Field	26
3.2	Porous Medium	27
3.2.1	Mean Flow	27
3.2.2	Turbulent Field	33
	References	35

4	Heat Transfer Using the Local Thermal Equilibrium Model	37
4.1	Input Parameters for the LTE Model	37
4.2	Grid Independence Studies for the LTE Model	38
4.3	Clear Channel	38
4.4	Channel with Porous Layer.	41
4.4.1	Effect of Porosity, ϕ	41
4.4.2	Effect of Channel Blockage, h/H	44
4.4.3	Effect of Darcy Number, Da	46
4.4.4	Effect of Thermal Conductivity Ration k_s/k_f	49
4.5	Integral Wall Heat Flux	50
	References	53
5	Heat Transfer Using the Local Thermal Non-Equilibrium Model	55
5.1	Input Parameters for the LTNE Model.	55
5.2	Grid Independence Studies for the LTNE Model.	55
5.3	Empty Channel	56
5.4	Channel with Porous Layer.	58
5.4.1	Effect of Reynolds, Re	58
5.4.2	Effect of Porosity, ϕ	60
5.4.3	Effect of Channel Blockage, h/H	62
5.4.4	Effect of Darcy Number, Da	64
5.4.5	Effect of Solid-to-Fluid Thermal Conductivity Ratio k_s/k_f	67
5.5	Integral Wall Heat Flux	69
	References	72
6	Concluding Remarks and Future Work	75
	References	75

Turbulent Impinging Jets into Porous Materials

de Lemos, M.J.S.

2012, XVI, 76 p. 47 illus., 17 illus. in color., Softcover

ISBN: 978-3-642-28275-1