

1. Record Nr.	UNINA9910829906103321
Titolo	Cellular and porous materials : thermal properties simulation and prediction // edited by Andreas Ochsner, Graeme E. Murch and Marcelo J. S. de Lemos
Pubbl/distr/stampa	Weinheim, [Germany] : , : Wiley-VCH Verlag GmbH & Co. KGaA, , 2008 ©2008
ISBN	1-282-01060-3 9786612010606 3-527-62140-7 3-527-62141-5
Descrizione fisica	1 online resource (442 p.)
Disciplina	536.23 536/.23
Soggetti	Porous materials - Thermal properties
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Cellular and Porous Materials Thermal Properties Simulation and Prediction; Contents; Preface; List of Contributors; 1 Interfacial Heat Transport in Highly Permeable Media: A Finite Volume Approach; 1.1 Introduction; 1.2 Governing Equations; 1.2.1 Microscopic Transport Equations; 1.2.2 Decomposition of Flow Variables in Space and Time; 1.2.3 Macroscopic Flow and Energy Equations; 1.2.4 Macroscopic Two-Energy Equation Modeling; 1.2.5 Interfacial Heat Transfer Coefficient; 1.3 Numerical Determination of h_i ; 1.3.1 Physical Model; 1.3.2 Periodic Flow; 1.3.3 Film Coefficient h_i 1.4 Results and Discussion1.4.1 Array of Square Rods; 1.4.2 Array of Elliptic Rods; 1.4.3 Correlations for Laminar and Turbulent Flows; 1.5 Conclusions; References; 2 Effective Thermal Properties of Hollow-Sphere Structures: A Finite Element Approach; 2.1 Introduction; 2.1.1 Finite Element Method and Heat Transfer Problems; 2.1.2 Hollow-Sphere Structures in the Context of Cellular Metals; 2.2 Finite Element Method; 2.2.1 Basics of Heat Transfer; 2.2.2 Weighted Residual Method;

2.2.3 Discretization and Principal Finite Element Equation; 2.2.4 Four-Node Planar Bilinear Quadrilateral (Quad4)
2.2.4.1 General Rectangular Quad4 Element; 2.2.4.2 Postprocessing;
2.2.5 Nonlinearities; 2.3 Modelling of Hollow-Sphere Structures; 2.3.1 Geometry, Mesh and Boundary Conditions; 2.3.2 Material Properties;
2.4 Determination of the Effective Thermal Conductivities; 2.4.1 Influence of the Morphology and Joining Technique; 2.4.2 Influence of the Topology; 2.4.3 Temperature-Dependent Material Properties;
2.4.3.1 Low Temperature Gradient; 2.4.3.2 High Temperature Gradient;
2.4.4 Application Example: Sandwich Structure; 2.5 Conclusions; References
3 Thermal Properties of Composite Materials and Porous Media: Lattice-Based Monte Carlo Approaches
3.1 Introduction; 3.2 Monte Carlo Methods of Calculation of the Effective Thermal Conductivity;
3.2.1 The Einstein Equation; 3.2.2 Fick's First Law (Fourier Equation);
3.3 Monte Carlo Calculations of the Effective Thermal Conductivity;
3.3.1 Effective Diffusion in Two-Component Composites/Porous Media;
3.3.2 Effective Diffusion in Three-Component Composites; 3.4 Determination of Temperature Profiles; References;
4 Fluid Dynamics in Porous Media: A Boundary Element Approach; 4.1 Introduction
4.1.1 Transport Phenomena in Porous Media; 4.1.2 Boundary Element Method for Fluid Dynamics in Porous Media; 4.2 Governing Equations;
4.3 Boundary Element Method; 4.3.1 Velocity-Vorticity Formulation;
4.3.2 Boundary Domain Integral Equations; 4.3.3 Discretized Boundary Domain Integral Equations; 4.3.4 Solution Procedure; 4.4 Numerical Examples; 4.4.1 Double-Diffusive Natural Convection in Vertical Cavity; 4.4.2 Double-Diffusive Natural Convection in a Horizontal Porous Layer; 4.5 Conclusion; References;
5 Analytical Methods for Heat Conduction in Composites and Porous Media; 5.1 Introduction
5.2 Mathematical Models for Heat Conduction

Sommario/riassunto

Providing the reader with a solid understanding of the fundamentals as well as an awareness of recent advances in properties and applications of cellular and porous materials, this handbook and ready reference covers all important analytical and numerical methods for characterizing and predicting thermal properties. In so doing it directly addresses the special characteristics of foam-like and hole-riddled materials, combining theoretical and experimental aspects for characterization purposes.
