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Tensor; 2.2.4 Upper Bound Estimate of the Permeability Tensor; 2.3 Training Set: Upper and Lower Bounds of the Permeability of a 2-D Microstructure; 2.3.1 Lower Bound; 2.3.2 Upper Bound; 2.3.3 Comparison

2.4 Generalization: Periodic Homogenization Based on Double-Scale Expansion

2.4.1 Double-Scale Expansion Technique; 2.4.2 Extension of Darcy's Law to the Case of Deformable Porous Media; 2.5 Interaction Between Fluid and Solid Phase; 2.5.1 Macroscopic Representation of the Solid-Fluid Interaction; 2.5.2 Microscopic Representation of the Solid-Fluid Interaction; 2.6 Beyond Darcy's (Linear) Law; 2.6.1 Bingham Fluid; 2.6.2 Power-Law Fluids; 2.7 Appendix: Convexity of (d); 3 Micro-to-Macro Diffusive Transport of a Fluid Component; 3.1 Fick's Law

3.2 Diffusion without Advection in Steady State Conditions

3.2.1 Periodic Homogenization of Diffusive Properties; 3.2.2 The Tortuosity Tensor; 3.2.3 Variational Approach to Periodic Homogenization; 3.2.4 The Geometrical Meaning of Tortuosity; 3.3 Double-Scale Expansion Technique; 3.3.1 Steady State Diffusion without Advection; 3.3.2 Steady State Diffusion Coupled with Advection; 3.3.3 Transient Conditions; 3.4 Training Set: Multilayer Porous Medium; 3.5 Concluding Remarks; Part II Microporoelasticity; 4 Drained Microelasticity; 4.1 The 1-D Thought Model: The Hollow Sphere

4.1.1 Macroscopic Bulk Modulus and Compressibility

4.1.2 Model Extension to the Cavity; 4.1.3 Energy Point of View; 4.1.4 Displacement Boundary Conditions; 4.2 Generalization; 4.2.1 Macroscopic and Microscopic Scales; 4.2.2 Formulation of the Local Problem on the rev; 4.2.3 Uniform Stress Boundary Condition; 4.2.4 An Instructive Exercise: Capillary Pressure Effect; 4.2.5 Uniform Strain Boundary Condition; 4.2.6 The Hill Lemma; 4.2.7 The Homogenized Compliance Tensor and Stress Concentration

4.2.8 An Instructive Exercise: Example of an rev for an Isotropic Porous Medium. Hashin's Composite Sphere Assemblage

Sommario/riassunto

Intended as a first introduction to the micromechanics of porous media, this book entitled "Microporomechanics" deals with the mechanics and physics of multiphase porous materials at nano and micro scales. It is composed of a logical and didactic build up from fundamental concepts to state-of-the-art theories. It features four parts: following a brief introduction to the mathematical rules for upscaling operations, the first part deals with the homogenization of transport properties of porous media within the context of asymptotic expansion techniques. The second part deals with linear micropo
