

Three-Dimensional Flow and Heat Transfer within Highly Anisotropic Porous Media

Numerical Determination of Permeability Tensor, Inertial Tensor, and Interfacial Heat Transfer Coefficient

F. Kuwahara and A. Nakayama

CONTENTS

6.1 Introduction	235
6.2 Volume-Averaged Governing Equations	238
6.3 Preliminary Consideration of Macroscopically Uniform Flow Through an Isothermal Porous Medium	239
6.4 Periodic Boundary Conditions for Three-Dimensional Periodic Structure	241
6.5 Quasi-Three-Dimensional Numerical Calculation Procedure	244
6.6 Method of Computation and Preliminary Numerical Consideration	246
6.7 Validation of Quasi-Three-Dimensional Calculation Procedure	248
6.8 Determination of Permeability Tensor	249
6.9 Determination of Forchheimer Tensor	252
6.10 Determination of Interfacial Heat Transfer Coefficient	256
6.11 Conclusions	262
Nomenclature	262
References	263

6.1 Introduction

In order to design efficient heat transfer equipment, one must know the details of both flow and temperature fields within the equipment. Such detailed flow and temperature fields within a manmade assembly may be investigated numerically by solving the set of governing equations based on the first

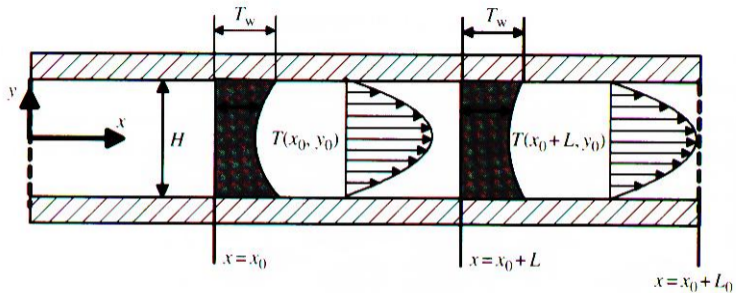


FIGURE 6.2
Fully developed channel flow.