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ABSTRACTS

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Theoretical and Numerical Prediction of the Permeability of Fibrous Porous Media

In this study, the absolute and relative (for two-phase flow) permeability of ordered fibrous porous media for normal flows is predicted theoretically and numerically. Moreover, microscopic velocity profiles and distribution of phases (for two-phase flow) in the "unit cell" are investigated in detail for normal flows. Porous material is represented by a "unit cell" which is assumed to be repeated throughout the media and 1D fibers are modeled. Fibers are presented as cylinders with the same radii. Planar flow that perpendicular to the axes of cylinders is considered in this study. There are many theoretical and numerical investigations of single-phase (one fluid) flow in fibrous porous media exists in the literatures [1-4]. The two-phase (two immiscible fluids) flow in the ordered fibrous porous media is considered in this study. All numerical calculations are performed using Gerris program [6]. In theoretical estimations assumed that the velocity profile is parabolic [1-2,5]. The quantitative comparison of numerical and theoretical results of computation of the absolute and relative permeability of ordered fibrous media is reasonably good and is about 10-15%.

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