Hsu, C. T.; **Cheng, P.**
Thermal dispersion in a porous medium. (English) Zbl 0703.76079
Int. J. Heat Mass Transfer 33, No. 8, 1587-1597 (1990).

Summary: The thermal dispersion conductivity tensor for convection in a porous medium is derived based on the method of volume averaging of the velocity and temperature deviations in the pores. The velocity and temperature deviations are obtained based on flow over a dilute array of spheres, incorporated with a scale analysis. A multiplying constant (i.e. the thermal dispersivity tensor) is introduced to account for the interaction of spheres. Separate considerations are given to the creeping flow at low Reynolds numbers, as well as boundary layer flow and wakes at high Reynolds numbers. It is found that the velocity and porosity dependencies in the thermal dispersion conductivity tensor are different for high Reynolds number and low Reynolds number porous media flows. The value of the transverse thermal dispersivity for a nearly parallel flow at high Reynolds numbers is determined by comparing the predicted heat transfer characteristics with existing experimental results for forced convection of water and air through heated packed channels and cylindrical packed tubes.

MSC:

76S05	Flows in porous media; filtration; seepage	Cited in **1** Review
76M25	Other numerical methods (fluid mechanics) (MSC2010)	Cited in **66** Documents

Keywords:

thermal dispersion conductivity tensor; convection in a porous medium; method of volume averaging; boundary layer flow; low Reynolds number porous media flows; cylindrical packed tubes

Full Text: DOI