World Journal of
Engineering

Wold Journal of Engineering 5(2) (2008) 95-99

Experiment and numerical simulation of contaminant transport in low permeability porous media

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(Received 23 June 2007; accepted 8 June 2008)

Abstract

In order to study the transport law of contaminant in low permeability porous media, the law and character of contaminant transport under different starting pressure gradients (SPG) are compared, and the course of contaminant transport in saturated low permeability porous media is simulated applying a mathematical model. The results indicate that SPG is different in different texture core and the larger the SPG, the lower the seepage velocity. The influence of hydrodynamic dispersion on contaminant transport is more obvious. From the simulation, it can be seen that the convective diffusion equation can simulate the course of contaminant transport in low permeability core accurately.

Key words: *Groundwater pollution, Non-Darcy fluid, Contaminant transport, Starting pressure gradient*

1. Introduction

Darcy's law has long been used in the analysis and estimation of water resources. Since the French hydraulic engineer-Darcy published the seepage law by experiment results. But in low permeability porous media, when the number of Reynolds is lower, Darcy's law is not suitable and where a starting pressure gradient existed (Deng, 1999; Zhu *et al*., 2005; Mao, 2005). The Limitation of varies from the different meet, even in the same territory, the different scholars has different idea.The upper limitation of low permeability in groundwater a domain is (100-1000) $\times 10^{-3}\mu m^2/s$, while in a petroleum domain it is (10-1000) $\times 10^{-3}\mu m^2/s$, in nuclear engineering, the upper limitation is (0.1-10)$\times 10^{-3}\mu m^2/s$. Though the upper limitation of low permeability porous media is various within different industries, all the information indicates that the lower the permeability, the more obvious the seepage character is. While permeability is lower to some value, the starting pressure gradient existed. Because of groundwater pollution either in the groundwater domain or petroleum domain, research of groundwater pollution becomes more important. Only the seepage equation and solution transport equation are coupled, the ideal result can be achieved (Sun, 1989; Zou *et al*., 2006). While in the seepage equation, if the

ISSN:1708-5284