Non Fickian Miscible Displacement in Porous Media

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Abstract

The miscible displacement of one incompressible fluid by another in a porous medium is mathematically described by a system of three equations : an elliptic equation for the pressure, Darcy's law for the velocity and a parabolic equation for the concentration of the displaced fluid in the fluid mixture. Some limitations have been pointed out in the literature on the use of a parabolic equation to describe the concentration evolution, namely related with the use of Fick's law that describes the mass flux. To avoid the pathologic behavior of the concentration induced by the classical diffusion equation, non Fickian corrections have been proposed in the literature. In this talk we discuss the mathematical modelling and the numerical simulation of singe phase non Fickian models that describe the displacement of an incompressible fluid by another in porous media.

Keywords: Fickian diffusion, non Fickian diffusion, pressure, velocity, concentration, numerical methods.