

ANALYTICAL APPROXIMATE EXPRESSION FOR PRIMARY IMBIBITION FRONT IN HOMOGENEOUS POROUS MEDIA

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Abstract

In this paper, primary counter-current imbibitions in homogeneous porous matrix is studied, where a wetting phase displaces non-wetting phase simultaneously, such that the non-wetting phase moves in the opposite direction to the wetting phase. In the present case the force mediating the displacement is only capillary pressure with wetting and non-wetting fluids flowing in opposite direction. Governing nonlinear differential equation has been formulated and solved by using the method of small parameter; an approximate expression for the wetting phase saturation has been obtained as infinite series with exponential terms. It has been found that saturation is distributed exponentially. Also saturation of injected fluid S_i increases at distance x_i as time t increase. It is concluded that after a long time t saturation of injected fluid will be closer to maximum depending on the parameter α which has been chosen as depending on saturation of wetting phase at initial time (at $t = 0, x = 0$) and at initial boundary (at $x = 0, t = 0$).

Key Words: *Primary imbibition, Counter-current flow, Porous media*

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