Cantagesso, Luana C. M.; **Sousa, Luara K. S.**; **Marotto, Tamires A.**; **Radovanovic, Anna M.**; **Pires, Adolfo Puime**; **Peres, Alvaro M. M.**

A semi-analytical solution for one-dimensional oil displacement by miscible gas in a homogeneous porous medium. (English) Zbl 1446.76156

Constanda, Christian (ed.) et al., Integral methods in science and engineering. Analytic treatment and numerical approximations. Based on talks given at the 15th international conference on integral methods in science and engineering, IMSE, Brighton, UK, July 16–20, 2018. Basel: Birkhäuser. 81-95 (2019).

Summary: In an enhanced oil recovery (EOR) project, materials not present in the reservoir are injected to improve the final oil recovery. Historically, gas flooding has been the second most applied EOR method. Recently, carbon dioxide injection has become more attractive because it is also environmentally friendly. In this chapter, we present a solution for oil displacement by miscible gas injection at constant rate. Our model considers a three-component, two-phase, 1-D incompressible flow in a homogeneous isothermal system. Dispersion, gravity, and capillary effects are neglected. Moreover, it is assumed that Amagat's law is valid and that viscosity depends on the phase composition only. This problem is governed by a system of two hyperbolic equations and is solved by the method of characteristics for saturation and concentrations. Then, the pressure profile is obtained by integrating Darcy's law over the spatial domain. This general solution is applied to a typical set of rock and fluid data.

For the entire collection see [Zbl 1417.65006].

MSC:

76S05 Flows in porous media; filtration; seepage
76T30 Three or more component flows
76M99 Basic methods in fluid mechanics
65M25 Numerical aspects of the method of characteristics for initial value and initial-boundary value problems involving PDEs

Keywords:

method of characteristics; Amagat law; Darcy law; hyperbolic equation

Full Text: DOI

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