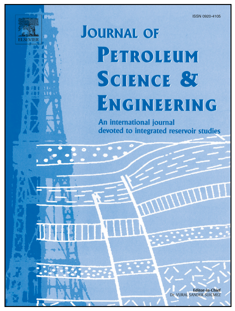
Accepted Manuscript



Comparative study of shale-gas production using single- and dual-continuum approaches

Mohamed F. El Amin, Sahar Amir, Amgad Salama, Dias Urozayev, Shuyu Sun

PII: S0920-4105(17)30572-7

DOI: 10.1016/j.petrol.2017.07.011

Reference: PETROL 4097

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 10 July 2016

Revised Date: 3 July 2017

Accepted Date: 5 July 2017

Please cite this article as: El Amin, M.F., Amir, S., Salama, A., Urozayev, D., Sun, S., Comparative study of shale-gas production using single- and dual-continuum approaches, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.07.011.

Comparative Study of Shale-Gas Production using Single- and Dual-Continuum Approaches

Mohamed F. El Amin[1,2], Sahar Amir[2], Amgad Salama[3], Dias Urozayev[2], Shuyu Sun[2]

[1]Effat University, Jeddah 21478, Kingdom of Saudi Arabia
[2]King Abdullah University of Science and Technology (KAUST), Thuwal 23955-6900, Kingdom of Saudi Arabia
[3]Regina University, Regina, Canada

Abstract

In this paper, we explore the possibility of specifying the ideal hypothetical positions of matrices blocks and fractures in fractured porous media as a single-continuum reservoir model in a way that mimics the dual-porosity dual-permeability (DPDP) configuration. In order to get an ideal mimic, we use the typical configuration and geometrical hypotheses of the DPDP model for the SDFM. Unlike the DPDP model which consists of two equations for the two-continuum coupled by a transfer term, the proposed single-domain fracture model (SDFM) model consists of a single equation for the single-continuum. Each one of the two models includes slippage effect, adsorption, Knudsen diffusion, geomechanics, and thermodynamics deviation factor. For the thermodynamics calculations, the cubic Peng-Robinson equation of state is employed. The diffusion model is verified by calculating the total mass flux through a nanopore by combination of slip flow and Knudsen diffusion and compared with experimental data. A semi-implicit scheme is used for the time discretization while the thermodynamics equations are updated explicitly. The spatial discretization is done using the cell-centered finite difference (CCFD) method. Finally, numerical experiments are performed under variations of the physical parameters. Several results are discussed such as pressure, production rate and cumulative production. We compare the results of the two models using the same dimensions and physical and computational parameters. We found that the DPDP and the SDFM models production rate and cumulative production behave similarly with approximately the same slope but with some differences in values. Moreover, we found that the poroelasticity effect reduces the production rate and consequently the cumulative production rate but in the SDFM model the reservoir takes