MATHEMATICAL MODELING OF THE IN-SITU PROCESSES IN AN OIL SHALE RESERVOIR

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Recently, the challenges associated with the recovery of unconventional hydrocarbon reserves become specifically important [1, 2]. One of the most promising unconventional oil sources is kerogen, which is known to generate gaseous and liquid hydrocarbons under heating. Rich with kerogen Bazhenov Formation in Russia seems to contain significant unconventional hydrocarbon reserves [3].

This paper is concerned with the mathematical modeling of the physical processes in a containing kerogen oil shale reservoir under heating. A new mathematical model of non-isothermal multicomponent three-phase flow in oil shale reservoir is presented. This model accounts for the kerogen's in-situ thermal decomposition. The thermal decomposition process of kerogen is modeled based on the Bazhenov Formation cores' pyrolysis data. With the field data obtained during thermal gas treatment of the Bazhenov formation [3], the evaluation of the generated from kerogen amount of light and intermediate hydrocarbons was integrated in the model. The resulting mathematical model was formulated as the initial-boundary value problem, which solutions were obtained numerically. In order to investigate the solutions under different values of the model parameters the proper software was developed. In a series of computational experiments the impact of model parameters' uncertainty was estimated.

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