CONTINUAL FLUID FILTRATION MODEL

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This work is aimed to design a program using the model described in [1]. The model includes two continuity equations: for vapor (1) and liquid phases (2). Filtration velocity is defined by Darcy's law with relative permeability functions $f_i(s)$, phases' pressures are supposed to be equal:

$$\frac{\partial m\rho_1 s}{\partial t} = -\frac{\partial \rho_1 u_1}{\partial x} + F_1,$$

$$\frac{\partial m\rho_2(1-s)}{\partial t} = -\frac{\partial \rho_2 u_2}{\partial x} + F_2,$$

$$u_i = -\frac{kf_i(s)}{\eta_i}\frac{\partial P}{\partial x}, i = 1, 2.$$

The hydrodynamic equations are combined with equations of state:

$$\rho_i = \frac{\mu_i(P,T)}{z_i(P,T)}\frac{P}{RT}, i = 1, 2.$$

The calculation of supercompressibilities z_i is processed using cubic equation of state, designed by Brusilovsky [2].

This work describes different attitudes for solution of the hydrodynamic equations and their discrete analogues. The validation of the numerical models is provided. The numerical stability and accuracy is analyzed. The main purpose of the work is describing flows that includes retrograde condensation.

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2. Batalin, O.Yu., Brusilovskii, A.I., and Zakharov, M.Yu., Fazovye ravnovesiya v sistemakh prirodnykh uglevodorodov (Phase Equilibria in Natural Hydrocarbon Systems), Moscow: Nedra, 1992.