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Contribution ID: **268** Type: **Poster (+) Presentation**

Identification of transport and clogging parameters of porous media

Wednesday, 2 June 2021 09:00 (1 hour)

Most natural porous media have a rather complex structure. Usually the solute transport in a porous medium is described within the framework of the standard diffusion model [1]. However, many experimental data [2, 3] cannot be explained into frameworks of such approach, because the transport through a porous medium is often complicated by the immobilization of solute. The immobilization leads to a change in the effective pore size, and it means the variation in the permeability of the medium. The change in permeability, in turn, leads to a change in the filtration rate. There are several of the most popular models describing the processes of solute immobilization during filtration through a porous medium [4-6].
In this work, the process of solute transport through a porous medium is experimentally studied. The experimental setup is constructed from a copper tube filled with a porous medium. Glass balls are used as porous filler. This is the most affordable filler option with well-controlled grain size. Distilled water is pumped through the tube, pumping is carried out with a constant pressure drop between the inlet and outlet. The pumping of a clean liquid is carried out until complete saturation of the medium. The saturation control is performed by the electronic balance, with an accuracy of at least 1%. A pumping of constant concentration NaCl solution starts in initial time moment. Simultaneously, the measurement of NaCl concentration and mixture flow rate at the outlet begins. The measurement is carried out continuously until the registration zero concentration and constant flow rate. As the result the breakthrough curve and the dependence of flow rate in time is obtained for each value of pressure drop and NaCl concentration.
To estimate the transport parameters of the medium, a one-dimensional problem of the solute transport was solved numerically. Darcy's equation [7] was used to model the flow in a porous medium. It was assumed that the permeability is an unambiguous function of the porosity of the medium (the measured porosity of the pure medium is 0.37). To model this dependence, the Kozeny-Karman relation was used [8]. The solute transport was modeled within the MIM approach with taking into account the saturation of immobile phase and linear kinetics of desorption [5]. It was assumed that in this case the porosity of the medium decreases in proportion to the volume concentration of the adsorbed solute. Thus, when solving the described problem, it is possible to obtain the dependence of the solute concentration and the flow rate at the outlet on time. Based on the comparison of the experimental data with the data obtained in the course of numerical simulation, we solve inverse problem of identifying the transport parameters of the medium. The values the sorption coefficients, the effective diffusion coefficient were obtained. It is also shown that within the limits of the method error, these parameters are practically independent of the pressure drop and the solute concentration at the inlet.
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Time Block Preference

Time Block A (09:00-12:00 CET)

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