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On Features of Capillary Flows as Predicted from Direct Comparison between Network Models and Experiments B. MARKICEVIC, K. HOFF, H. LI, A. ZAND, H. K. NAVAZ, Kettering University — Having imbibed a particular volume of a wetting liquid by porous medium, a spontaneous capillary flow of liquid within porous medium itself takes place. The flow has been investigated experimentally for the unidirectional flow conditions, where the spatial and temporal changes of the liquid saturation are measured. The axial saturation profiles and their changes in time are also predicted numerically using the capillary network models. For each specific porous medium|liquid pair, the experimental and numerical saturation profiles are matched, and from numerical calculations, a unique capillary pressure and relative permeability as functions of saturation are found. The fine and medium grain sands as porous media are used, which are not significantly different in their structure. Starting with this assumption, we are able to reduce both relative permeability and capillary pressure into single dependencies. It is found that the relative permeability falls onto the same curve without any further reducing factor, whereas for the capillary pressure, the Leverett J-functions scales are sufficient. For two distinct liquids, the liquid surface tension and contact angle are used. For two sands, the scale is obtained from the sand permeability and porosity. Two network parameters: pore size distribution and liquid residual saturation are used in predicting the experimental data.

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