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Title : Imbibition and Drainage Processes in Porous Media from the Perspective of Invaded Percolation Probability

Invasion processes, such as the imbibition and drainage processes, through porous media could be modeled by the invasion percolation model in a pore-network that is extracted from actual or virtual packed grains. It is well known that water retention properties depend on the pore structures such as pore shape, pore-size distribution, and pore-connectivity. But in our previous works, it is confirmed that there is a spatial structure even in a porous medium packed with single-size grains, and that if the spatial structure of pores is not disturbed, different water retention curves obtained from different pore-size distributions for imbibition process can be unified into a single curve by using the invaded percolation probability, which is the proposed index based on the percolation probability. In this study, the drainage process is evaluated by the water retention curves and the invaded percolation probability through numerical experiments. The results show that the different water retention curves were unified into a certain curve based on the percolation probability, but relatively large variation were seen in the rising point in the curves that corresponds to the air-entry point, which was not seen in the imbibition process.