Contribution ID: **175** Type: **Oral Presentation**

Digital rock approach for unconsolidated sandpacks using pore network modelling: comparison between experiments and simulations

Thursday, 3 June 2021 11:00 (15 minutes)

Multiphase flow properties such as the capillary pressure and the relative permeability are a crucial parameter for subsurface evaluation and engineering such as oil & gas development and CCS projects. The measurement of the relative permeability of unconsolidated rocks is extremely difficult due to the collapse of samples and the influence of changes in the internal structure due to particle movement during the test. In addition, there have been few examples of relative permeability measurements using unconsolidated rocks due to the difficulty in handling test and spend a long time.

On the other hand, the research has been conducted to extract pore structure with micro X-ray CT imaging. These images can be used to extract a pore network model (PNM) which can be used to obtain the capillary pressure and relative permeability of rocks [1] [2]. Thus, the purpose of this study is to quantitatively evaluate the capillary pressure and relative permeability of unconsolidated sandstone by applying the PNM. In this contribution, we show the results of the validation of the method to quantitatively evaluate the absolute permeability and the capillary pressure of unconsolidated sandstone by applying the PNM to unconsolidated rocks.

To evaluate the validity of the method, sandpacks were prepared using single-grained sands to simulate a unconsolidated sandstone, and CT images of the sandpacks were acquired. And to evaluate the validity of the PNM, the pore structure was extracted from the CT images and the PNM was developed. This presentation will show the comparison of the absolute permeability and capillary pressure between experimental measurements and simulations. First, the absolute permeability obtained with the PNM was fairly consistent with that measured on the different packs composed of the same sand grains. Furthermore, it gave a good agreement with the permeability obtained by direct numerical simulation performed on the pore structure extracted from the same CT images. Next, we compared the capillary pressure and relative permeability obtained by the PNM with the experimental values. When a water-wet system was assumed, the simulated values showed a good agreement with the experimental values.

From these results, it is concluded that the fluid parameters of unconsolidated sandstone can be obtained simply by constructing the PNM.

Time Block Preference

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

References

[1] Idowu, N., Nardi, C., Long, H., & Øren, P. E. (2012). Pore-Scale modelling: Effects of network properties on predictive capabilities. Oral presentation of paper SCA, 35.
[2] Ruspini, L. C., Farokhpoor, R., & Øren, P. E. (2017). Pore-scale modeling of capillary trapping in water-wet porous media: A new cooperative pore-body filling model. Advances in Water Resources, 108, 1-14.

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