

Microtomography of multiphase flows in porous media

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Flow of water around the trapped oil blobs (red). After the image (b), special dye (yellow) was added to water. Change in color from transparent to yellow corresponds to local flow speed of water. The difference between individual images is 10 minutes.

Multiphase flow in porous media occurs in many practical situations including carbon dioxide capture and storage, enhanced oil recovery, remediation of polluted ground, and soil science.

However, since porous media are optically opaque, there is only a limited knowledge of phenomenological descriptions of the average fluid properties over several <u>pores</u>.

Recent rapid improvements in X-ray computer tomography allow us to directly visualize fluid dynamical events at the pore scale.



Now, a team of energy engineers at Tokyo Tech is devising ways to adapt a microtomography scheme to visualize multiphase flows in porous media. A new tracer scheme was developed to visualize the flow field of multiphase flow in porous media on tomograms.

When oil was produced from reservoirs, a large fraction of the oil was trapped in pores. Water invaded into the throat of pores, and snapped off the oil blobs from the continuous oil. After that, the water surrounding the trapped <u>oil</u> blobs became stagnant. These findings are helpful to improve <u>oil recovery</u> from reservoirs.

The new visualization scheme could be used to produce visual information on transport in porous media.

More information: Arief Setiawan, Tetsuya Suekane, Yoshihiro Deguchi, Koji Kusano. Three-Dimensional Imaging of Pore-Scale Water Flooding Phenomena in Water-Wet and Oil-Wet Porous Media. *Journal of Flow Control, Measurement & Visualization*, 2014, 2, 25-31. DOI: 10.4236/jfcmv.2014.22005

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