Application Note RACCT9020

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Three sandstone porosity comparison by X-ray CT

About the sample: Sandstone

Sandstone is a clastic sedimentary rock composed mainly of sand-like silicate grains. There is a lot of void or pore space between those grains, and sandstones can contain petroleum in that space. The porosity, pore network, and permeability are important parameters that indicate how well or easily you can extract petroleum from sandstones. X-ray CT (computed tomography) is one of the very effective techniques to study those parameters.

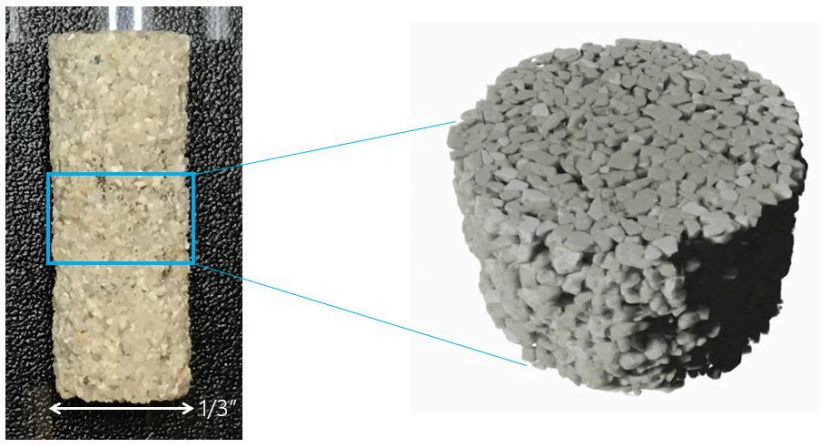
Analysis procedure

1. In this example, three types of sandstones (Idaho Gray, Crab Orchard, and Liver Rock) were scanned using a micro-CT scanner, CT Lab HX.
2. The resulting images were segmented into sand grains and void space.
3. The porosity was calculated and compared among the three samples.

1. CT scan

The middle part of the Idaho Gray 1/3" core sample was scanned to produce the 3D grayscale CT image. A 3D rendered CT scan is shown on the right.

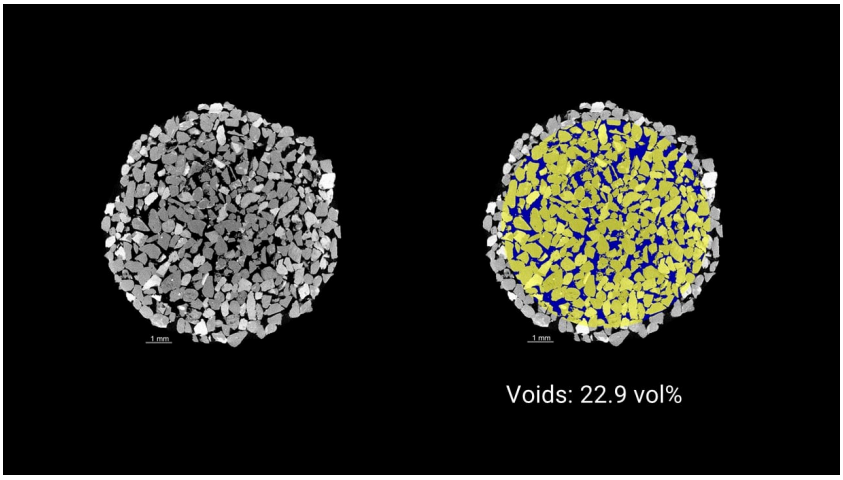
The gray level in CT data represents the relative density. The sand grains appear in light gray while the pore space (air) appears black.



2. Image segmentation

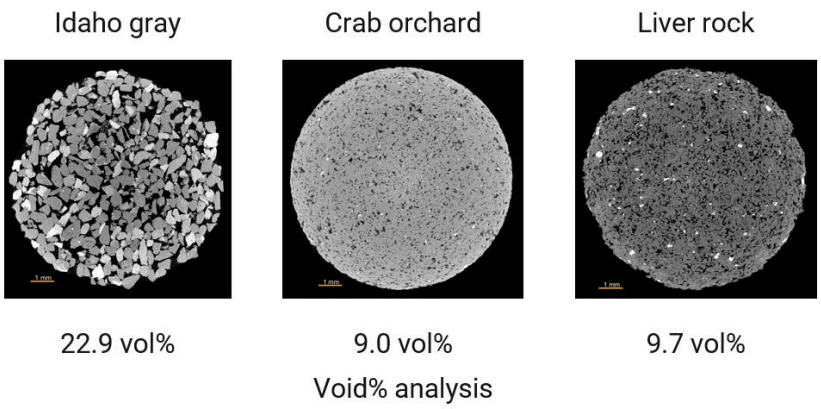
The Idaho Gray CT image was segmented into sand grains (yellow) and void space (blue) using Otsu binarization (gray-level thresholding method).

The porosity was calculated as a void volume percentage, 22.9 vol%. The area close to the sample surface was excluded from the calculation not to include any outside air as voids.



3. Quantitative comparison

The Idaho Gray showed a significantly higher void percentage of 22.9 vol% compared to Crab Orchard and Liver Rock, 9.0 vol% and 9.7%, respectively.



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