Application Note RACCT9018

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Sandstone Grain Size Analysis 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.

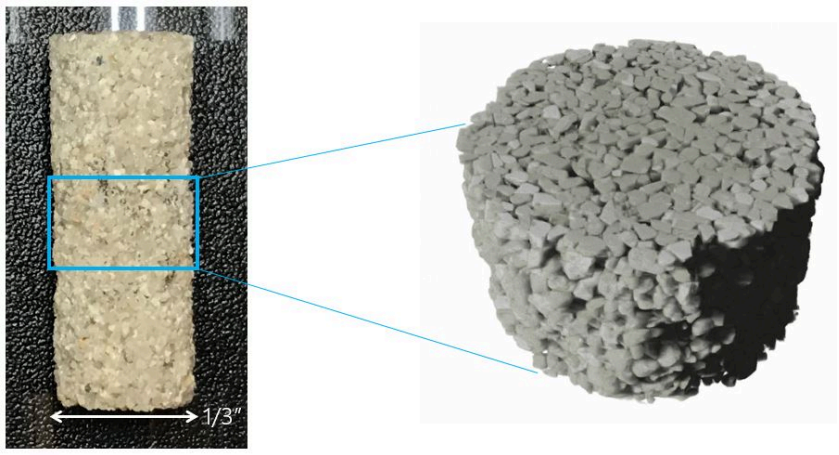
Analysis procedure

1. In this example, a sandstone core (Idaho Gray) was scanned using a micro-CT scanner, CT Lab HX.
2. The resulting image was segmented into sand grains and void space.
3. The individual grains were separated and grain size distribution was analyzed.

1. CT scan

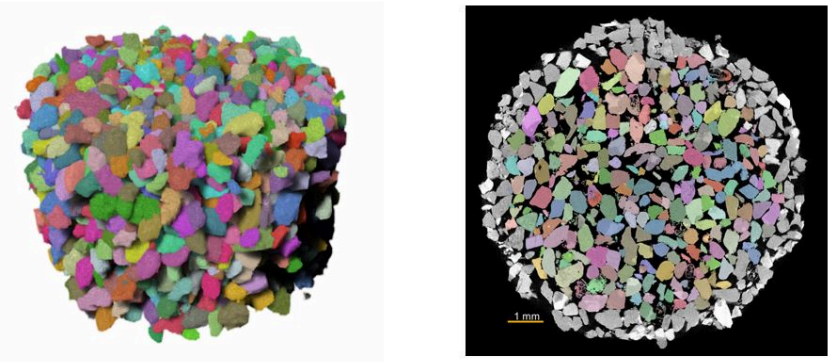
The middle part of the Idaho Gray 1/3" core sample was scanned to produce the 3D grayscale CT image. A 3D rendered CT scan is shown on the right.

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

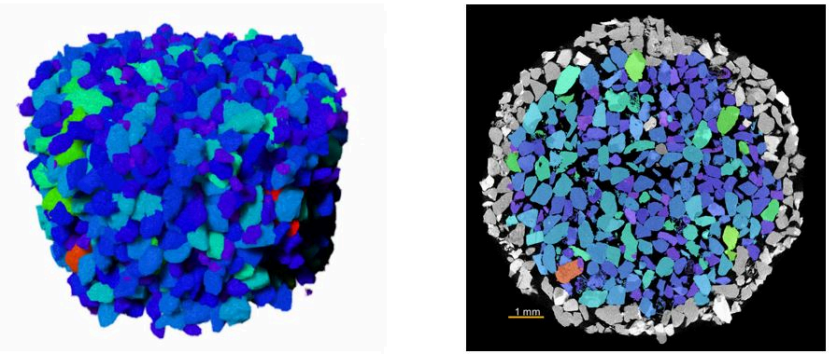
The Idaho Gray CT image was segmented into sand grains and void space using the gray-level thresholding method. The individual grains were separated using the watershed transformation. The 3D rendering of the void space is shown in the figure.



Grain indexing by object separation

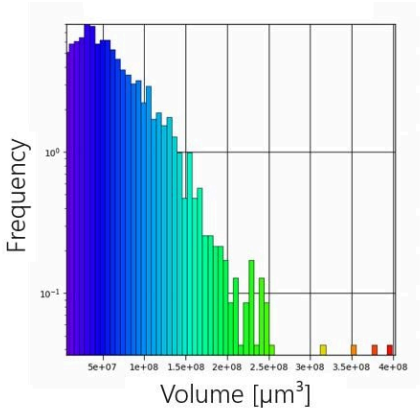
3. Porenetwork analysis

The grain sizes were calculated from the object separation results. The grains are color-coded from less than 5E+7 cubic microns (purple to blue) to about 4E+8 cubic microns (orange to red).



Grain size distribution

From the size distribution histogram, you can see that most grains are 1E+07 - 08 cubic microns in volume, and there are several grains over 3E+08 cubic micron size grains.



Mean volume: 5.5 x 10^7 µm³

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