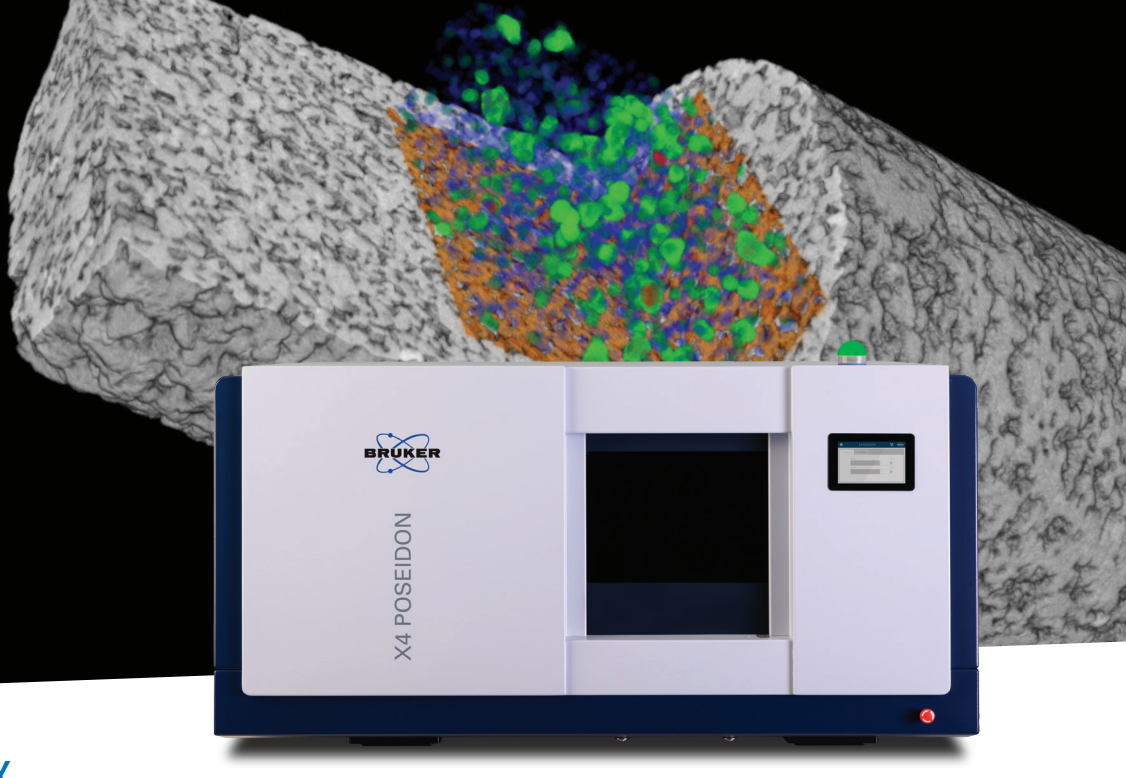


## X-RAY MICROSCOPY

# X4 POSEIDON – Sandstone Mini Core Plug

Application Report 1

X-ray Microscopy (XRM) is a cutting-edge imaging technology that plays a crucial role in geosciences and petroleum engineering by enabling non-destructive, high-resolution 3D imaging of geological materials. This advanced technique allows for precise characterization of porosity, grain size, fractures, and anomalies, while also facilitating sample reconstruction without causing damage. Furthermore, XRM distinguishes and maps mineral phases within complex rock matrices, providing unparalleled insights into geological structures.

The non-destructive nature of XRM permits repeated analyses of the same sample, making it ideal for studying dynamic processes in 3D over time. For example, XRM is widely used to observe real-time phenomena such as mineral dissolution and precipitation, compaction under stress, and fluid-rock interactions.

These capabilities offer valuable insights into critical processes like groundwater flow, carbon sequestration, and subsurface contamination. XRM has transformed geosciences by providing a deeper understanding of subsurface processes and material properties. Its ability to integrate detailed imaging, dynamic flow experiments, and digital modeling positions it as a vital tool for advancing research, improving resource recovery, and addressing environmental challenges.

The POSEIDON X4 microCT imaging workstation is a 3D imaging core facility on your desktop. The following settings were used for this study:

- 7 Mpixel Flat-panel X-ray camera
- 70 kV Overview scan duration: 2 min (continuous)
- Zoomed scan duration: 84 min
- Voxel resolution: 8 µm
- Voxel resolution: 2 µm

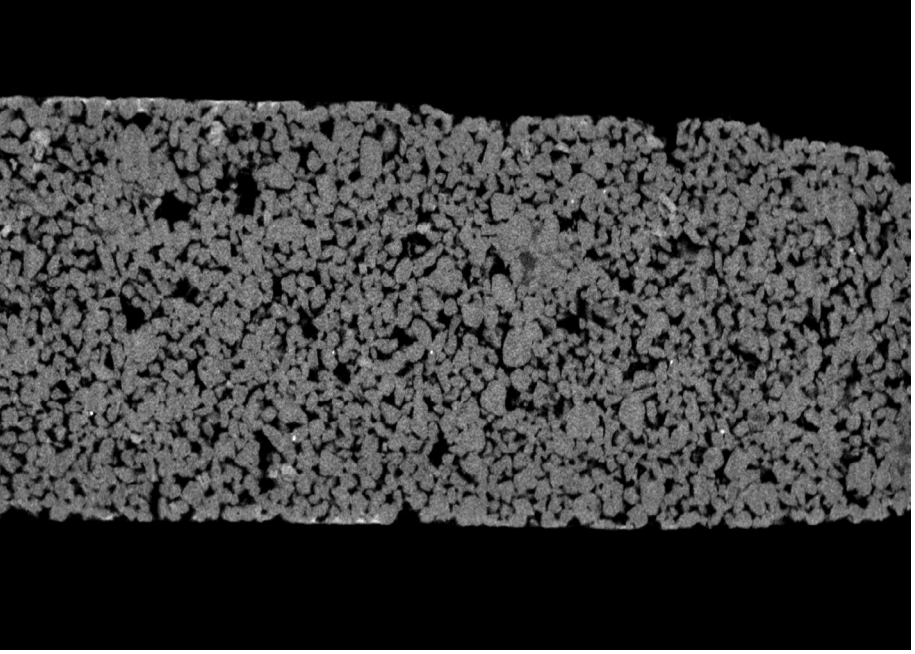

**Figure 1**
Orthogonal slice of the sandstone extracted from the fast overview scan.

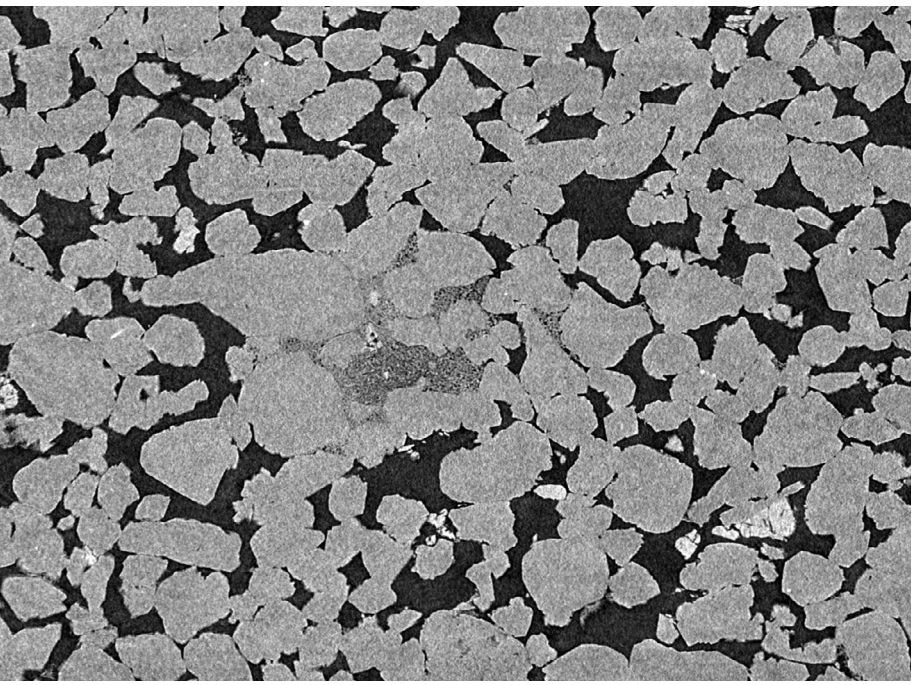

**Figure 2**
Detailed image extracted from the zoomed scan showing themicroscopic internal structure reveals pore fillings (clay) and contained porosity.

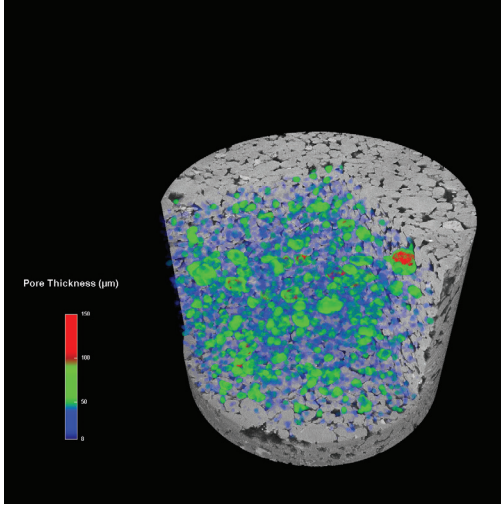


**Figure 3**
Pore size distribution analysis. Pores are color coded based on their size.

A virtual orthogonal slice view (Figure 1) of the sandstone mini core plug provides a clear overview of the sample. Completed in just 2 minutes, reveals key features such as porosity, grain size distribution, and anomalies like pore fillings. Additionally, visible high-density particles are dispersed throughout the sample.

By performing a focused, high-resolution scan on regions of interest (Figure 1), finer details can be revealed (Figure 2). This scan highlights the presence of clay fillings with intricate pore structures.

The pore size distribution within the highlighted region can be quantitatively analyzed using CT Analyzer (CTAn). Figure 3 illustrates the analyzed pore size distribution, which is color-coded to allow correlation between position and pore size.



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