

Accepted Manuscript

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PII: S0001-8686(17)30353-6
DOI: doi:[10.1016/j.cis.2017.12.009](https://doi.org/10.1016/j.cis.2017.12.009)
Reference: CIS 1853

To appear in: *Advances in Colloid and Interface Science*



Please cite this article as: Iglauer Stefan, Lebedev Maxim, High pressure-elevated temperature x-ray micro-computed tomography for subsurface applications, *Advances in Colloid and Interface Science* (2017), doi:[10.1016/j.cis.2017.12.009](https://doi.org/10.1016/j.cis.2017.12.009)

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High pressure-elevated temperature x-ray micro-computed tomography for subsurface applications

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Abstract

Physical, chemical and mechanical pore-scale (i.e. micrometer-scale) mechanisms in rock are of key importance in many, if not all, subsurface processes. These processes are highly relevant in various applications, e.g. hydrocarbon recovery, CO₂ geo-sequestration, geophysical exploration, water production, geothermal energy production, or the prediction of the location of valuable hydrothermal deposits. Typical examples are multi-phase flow (e.g. oil and water) displacements driven by buoyancy, viscous or capillary forces, mineral-fluid interactions (e.g. mineral dissolution and/or precipitation over geological times), geo-mechanical rock behaviour (e.g. rock compaction during diagenesis) or fines migration during water production, which can dramatically reduce reservoir permeability (and thus reservoir performance).

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