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Experimental Investigation of Mineral Precipitation Dynamics in Porous Media and Its Impact on Rock Properties

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Mineral precipitation in porous media can significantly alter essential rock properties such as porosity and permeability, which are crucial for subsurface applications including geothermal energy production, CO_2 storage, and water resource management. This study utilizes XRCT-assisted core flooding experiments to systematically track the development and propagation of the mineral precipitation front, analyzing its effects on rock properties over time. We also measure seismic velocities at various stages of the experiment to dynamically assess changes in the medium's elastic properties as mineral precipitation progresses.

High-resolution XRCT imaging reveals the variability in mineral morphology influenced by flow conditions within the pore space, highlighting the complex interplay between geochemical reactions and flow dynamics. Additionally, by linking variations in seismic response to different stages of mineral clogging, we explore the potential for using seismic data to infer clogging risks in subsurface environments. Our results offer valuable insights into how varying flow conditions dynamically influence rock properties and underscore the importance of integrating multiple experimental techniques for comprehensive analysis.

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References

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