Contribution ID: **70** Type: **Oral Presentation**

Temporal Dynamics of Reactive CO2 Flow in Carbonate Rocks: Insights from 4D Synchrotron Imaging

Tuesday, 20 May 2025 09:20 (15 minutes)

This study investigates the dynamics of reactive CO_2 transport in carbonate rock, emphasizing the effects of carbonic acid-induced formation damage. We provide real-time visualizations of these processes using 4D high-resolution synchrotron imaging at the I13 beamline at Diamond Light Source. The research captures and quantifies the temporal effects of reactive CO_2 transport at the pore scale in carbonate rock. During the experiment, CO_2-saturated brine was injected into the sample for 5 hours, with 12 images acquired to monitor different stages of chemical dissolution. The fluid was injected at 0.04 ml/min under 8 MPa pressure and 50℃ conditions, simulating rapid flow in the near-wellbore region. Image analysis reveals a channelized dissolution pattern accompanied by a gradual increase in porosity due to changes in the pore structure. Pore network models derived from segmented images were used for drainage and imbibition simulations, which indicated a reduction in capillary entry pressure as pore connectivity increased post-dissolution. Additionally, trapping efficiency was quantified, revealing a slight decline with dissolution as pores widened and became more interconnected.

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References

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