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Rock microfluidics under pressure: enabling geochemical observations at subsurface conditions

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Real-rock microfluidics have enabled elucidation of *in situ* fluid-rock interactions at the fundamental scales of length and time ($\sim \mu\text{m}$, ms). These platforms are categorized broadly into three classes: those constructed from rock material (e.g., calcite, shale) that are pressure-constrained by the mechanics of the crystal substrate, those deposited with mineral particulates (e.g., kaolinite, brucite, etc.) that lack spatial control and realism, and those precipitated with minerals *in situ* that are limited to systems with fast reaction kinetics. Microscale resolution of geochemical interactions in decarbonization-critical lithologies such as basalts at realistic subsurface conditions, as a result, remain inaccessible. In this talk, I will show a new platform that enables, for the first time, the direct observation of geochemical interactions within natural mafic matrices at elevated pressures and temperatures representative of subsurface environments. Interfacial reactions are characterized for mono- and di-mineralic systems to understand the nonlinear influence of secondary species on overall reaction kinetics.

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References

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