

Faculty Name:

Shaina Kelly

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Lab:

Kelly Lab (PoreStore)

Project Title:

Lab-on-a-chip studies of geologic CO₂ storage mechanisms

Description:

Geologic storage of CO₂ is a critical decarbonization pathway. CO₂ and other non-aqueous fluids may be stored in subsurface reservoirs through four trapping mechanisms (physical/structural, capillary, dissolution, and mineralization trapping) all of which exhibit spatial-temporal changes throughout a porous material. This research project seeks to quantify the effect of pore-scale processes on the interplay between transport phenomena and fluid-mineral interactions in subsurface porous media.

Concurrent with numerical simulations and core-scale experiments performed by other Kelly Lab students, selected summer researchers will leverage 2D (planar) and 3D microfluidics and/or nanofluidics methods to fabricate controlled porous media environments. These lab-on-a-chip setups will enable investigation of the influence/interplay of pore-confinement on fluid and solute flow and geochemical reactions. Methods may include integrating pieces of rocks directly into fluidic systems, etching patterns directly on mineral surfaces, Hele-Shaw constructs with nanoscale apertures, sintering, electron beam lithography, NanoScribe 3D lithography (a higher-resolution alternative to 3D printing), and film deposition and etching. New lab-on-a-chip, fabrication, and fluidic methods to isolate capillary, film, and geochemical dynamics in nanoconfinement are welcomed. University user facilities will be leveraged for micro/nanofluidics fabrication and time-lapse correlative microscopy (confocal, DIC, and fluorescence).

Location of Research:

On-Site

of hrs/week:

30

Department/Program:

Earth and Environmental Engineering

Eligibility:

BS, Third Year, BS, Fourth Year, MS

To apply, please contact:

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