Geochemical alteration of shale fractures and the bordering rock matrix

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The hydraulic properties of shales, which are dominated by fractures, control fluid migration and mass transfer and thus the performance of subsurface systems such as geologic carbon storage and unconventional oil and gas recovery. The injection of acidic fluids into the shale formations associated with these practices drives a number of geochemical reactions. These in turn can trigger dynamic changes in fracture morphology and thus hydraulic and mechanical properties, especially in carbonate rich shales. Our studies have shown that differential dissolution of mineral phases can lead to the development of porous altered layer on the fracture surfaces. As a result, reactive minerals in the rock matrix become accessible for subsequent dissolution, but at a rate controlled by diffusion. The altered layer may also disaggregate and detach from the fracture surface following the removal of the cementing material, causing fracture opening and particle mobilization. Moreover, divalent cations introduced through non-native fluid injection or released by mineral dissolutions can precipitate at low flow rate and in transport limited regions. Mineral precipitation in pore throats and fractures can reduce permeability and diffusivity in fractured shales. Here, using an integrated experimental and modeling approach, we examine the impacts of flow regimes and mineral composition on dissolution patterns in the fractures, the potential of fracture sealing by mineral precipitation, and the transport properties of the bordering rock matrix.

# *Understanding shale-gas-fluid interactions for water and energy*

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Shale plays an important role in water and energy sustainability. It is the source rock for natural gas and oil, the caprock for geologic $CO_2$ sequestration, and the low permeable barrier for nuclear waste disposal. In the subsurface environment where shale exists, formation fluid or fluids introduced from surface can interact with shale via geochemical and biogeochemical processes that can alter flow of gas, oil, and water that are critical for water and energy applications.

The topics that would be covered in this session are, but are not limited to:

- Shale characterization
- Fluid imbibition by shale
- Wettability alteration
- Natural gas dissolution and extraction
- Ion sorption and exchange
- Microbial activities in shale systems
- Mineral dissolution and precipitation
- Alteration in shale fracture
- Alteration in pore sizes and connectivity

Understanding these interactions help us improve energy production and reduce environmental impacts. We invite you to submit abstracts on shale-gas-fluid interactions that aim at supporting water and energy sustainability. Studies across multiple scales and using either experimental or modeling methods are all welcome.

Please submit your abstracts using Division of Geochemistry: Call for Papers at https://callforpapers.acs.org/orlando2019/GEOC
General information about the conference can be found at www.acs.org/meetings
Any other inquiries should be directed to the symposium organizers:

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