Unconventional shale gas

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Shale gas is natural gas produced from carbonaceous shale formations that typically function as both the reservoir and source rocks for the natural gas. Carbonaceous shales are organic-rich shale formations that were previously regarded only as source rocks and seals.

Shales are deposited as muds in low-energy environments such as tidal flats and deep water basins. During the deposition of these very fine-grained sediments, there can also be accumulation of organic matter in the form of algae, plant, and animal derived organic debris. Natural gas is stored in shale in three forms: free gas in rock pores, free gas in natural fractures, and adsorbed gas on organic matter and mineral surfaces.

For gas-shale production in 1998, light sand fracturing (water fracture treatment) was introduced and has been successful in many areas. Micro-seismic fracture mapping has also been successfully used to improve the evaluation of hydraulic fracturing in horizontal wells. The unconventional gas reservoir will produce less gas for the longer period of time compared to the high permeability reservoir. It is estimated that we have 16,000 Tcf gas as shale gas. This data indicates that there is enough opportunity to explore unconventional energy as future source of energy.

Anomalous kinetics of reactive Fronts in porous media

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The dynamics of reactive transport phenomena in porous media derive from the interaction of microscopic mass transfer and reaction processes. The understanding of observed reaction behavior requires the quantification of these microscale processes and their impact on the large scale reaction and transport behavior. Here we study the mixing limited (fast) reaction A + B --> C at the pore-scale, and its effective behavior on the mesoscale, as a paradigmatic case that allow us to provide a connection between local mixing properties and global reaction kinetics.

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