Contribution ID: **538** Type: **Poster + 3 Minute Pitch**

Effect of salinity on the transport of heavy metals and radionuclides in reactive porous media

Wednesday, 16 May 2018 16:55 (2 minutes)

Hydraulic fracturing (or fracking) is a well stimulation technique for unconventional oil and gas extraction [1]. Around 8-38 million cubic meters of fracking fluid containing water, chemicals, and sand are injected into the shale every day [2]. High-pressure injection of fracking fluids allows to create fractures and mobilize the gas and the oil towards the surface. Together with the gas, a hypersaline brine (i.e., the flowback and the produced water) is extracted which contains heavy metals and radionuclides, such as barium, strontium, and radium. Spills of flowback and produced water into the subsurface may occur during operation, handling, and storage with potential negative impact on potable aquifers. However, the behavior of the heavy metals and radionuclides at the condition of hypersaline brine has not been studied, yet.
Here, we present an experimental and modeling work to describe the effect of salinity on the transport of the major cations in the produced water. We selected goethite-coated silica beads as reactive material. We performed column-flood experiments using both produced water (obtained from MSEEL, WV) and synthesized produced water. A triple layer model (TLM) [3] was developed and implemented in PHREEQC to simulate the metal transport behavior. Preliminary experiments were performed by injecting a pH 8 solution containing barium at various salinity into a column filled with goethite-coated beads. Results show that the retardation of barium significantly decreases with salinity due to its decreasing free ion activities. This suggests that in a case of a spill of produced water within an aquifer containing iron-oxide mineral, a fast migration of the major cations may occur with a potential negative impact on aquifer water quality.

References

[1] Gandossi, L. and Von Estorff, U., 2015. Scientific and Technical Research Reports. Joint Research Centre of the European Commission; Retrieved 31 May 2016.
[2] U.S. EPA, Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources. Office of Research and Development, Washington, D.C., February 7, 2011.
[3] Davis, J. A., Leckie, J. O., 1978. Surface ionization and complexation at the oxide/water interface ii. surface properties of amorphous iron oxyhydroxide and adsorption of metal ions. J. Colloid Interface Sci. 67 (1), 90–107.

Acceptance of Terms and Conditions

Click here to agree

Primary authors: Ms YE, Zi; Prof. PRIGIOBBE, Valentina

Presenter: Ms YE, Zi

Session Classification: Parallel 8-A

Track Classification: MS 1.11: Conservative and Reactive Transport of Charged Species in Permeable and Impermeable Porous Media