Contribution ID: **255** Type: **Poster + 3 Minute Pitch**

Investigation of mineralogical heterogeneity in chemical dissolution of sandstones

Tuesday, 15 May 2018 16:58 (2 minutes)

Reactive transport in sandstones is of importance for applications including acid stimulation methods, contaminant remediation and carbon dioxide sequestration. Natural sandstones consist of various minerals. These different minerals can lead to large discrepancy in predicting petrophysical properties. Simulation results of multi-mineral and single mineral reactions are compared to illustrate the impact of mineralogical heterogeneity on reactive transport behaviors in sandstones.A reactive transport model based on lattice Boltzmann and finite volume method is applied to simulate dissolution in sandstones. The model includes the solute transport, chemical dissolutions and solid update. It is validated by comparing against reaction simulations in fracture geometry and dynamic imaging experimental observations. The imaging technique QEMSCAN SEM-EDS is used to acquire 3D mineral mapping of sandstones. 3D X-ray micro-CT tomogram is then segmented based on the correlation between X-ray attenuation of tomogram. Multi-mineral reaction simulations are performed on images containing various minerals. The results are then compared with the prediction of single mineral dissolution.Simulation results of multi-mineral and single mineral reactions are compared in different flow regimes. Permeability variations are studied in different flow regimes. Average reaction rates, surface area and pore size distributions are also presented. It is found that the existence of various minerals results in more heterogeneous dissolution in sandstones due to the different reaction rates. Mineralogical heterogeneity leads to significant errors of permeability prediction when single mineral is assumed in sandstones. This error is related with flow regimes. In low Péclet regimes, the predicted permeability is overestimated. However, in regimes with high Péclet, it is lower than the results in multi-mineral reaction. Compared with high Péclet regimes, the errors are more significant in low Péclet regimes. The average dissolution rates in multi-mineral simulation are higher than the prediction in single-mineral reaction. This is due to the uneven dissolution in multi-mineral reaction. Large discrepancy is also observed in pore size distributions. The pore sizes are more uniform in multi-mineral dissolution during the dissolution. This study improves the understanding of reactive flow and illustrates the strong dependence of mineralogical heterogeneity on reaction rates in reactive transport.

References

Acceptance of Terms and Conditions

Click here to agree

Primary authors: LIU, Min; MOSTAGHIMI, Peyman

Presenter: LIU, Min

Session Classification: Parallel 5-H

Track Classification: MS 4.18: Coupling multi-physic at the pore-scale: experimental and numerical investigation