Contribution ID: **501** Type: **Poster (+) Presentation**

Modeling on contaminants removal by foam with nanoparticles in heterogeneous porous media

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Bubbles dispersed into a liquid phase create a wet foam, which is a complex fluid with a volume fraction of the gas phase up to 97 vol.\%. It controls the flow front by the Jamin Effect and directs the fluid into areas that were previously difficult to reach by water or gas. Nanoparticles have been used to stabilize bubbles. They can adsorb at the gas-liquid interface providing enhanced stability to the foam and moving with foam. This process opens the opportunity for the foam to deliver the nanoparticles in heterogeneous porous media to overcome challenges like viscous fingering, inhibited sweep, etc. Application is, e.g., in the remediation of contaminated sites. There are few worked in the literature focused on reactive nanoparticle transport in porous media with bubbles and at the current stage transport models cannot describe the system as the mechanisms of particle-particle and particle-bubble interaction during transport are not well understood, yet.

Here, a modeling work focusing on removing contaminants from 2D heterogeneous porous media by foam with reactive nanoparticles is presented. Upon previous experimental studies, the transition between weak foam and strong foam has been incorporated to describe different foamability of surfactants. Also, constitutive equations for degradation, attachment/detachment, straining, and agglomeration were accounted for in the model. It was observed that the distribution of nanoparticles could be significantly enhanced by the foam and reaching low permeability zones. The remediation period is reduced compared with nano-remediation and the back diffusion phenomena were prohibited. From the prospective of an environmental engineering application in nano-remediation, this work suggests that foam can be a valuable alternative to conventional methods to deliver nanoparticles in the subsurface in an efficient and sustainable manner, given the negligible amount of water required.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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