

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Figure S1: Fluid flow velocity and streamlines in the porous media (simulated by COMSOL 6.0); Video S1: The record of fast pH changes when acid sweeps DI water at the flow rate of 250 $\mu\text{L}/\text{min}$; Video S2: A coinjection test of DI water and acid at flow rate of 10 $\mu\text{L}/\text{min}$ shows a relatively steady state is achievable.

https://drive.google.com/file/d/1HDbliqY0Sj7TtmuHq8kkdYvwr8Xa8S0W/view?usp=drive_link

Video S1: The record of fast pH changes when acid sweeps DI water at the flow rate of 250 $\mu\text{L}/\text{min}$

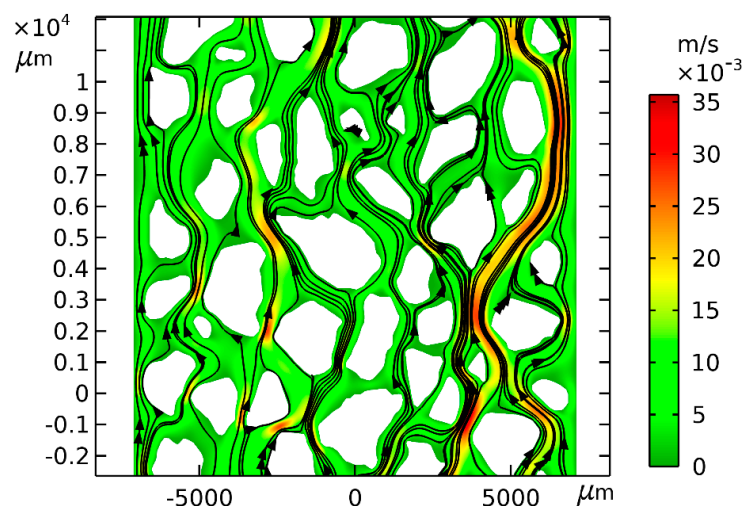


Figure S1. Fluid flow velocity and streamlines in the porous media (simulated by COMSOL 6.0)

https://drive.google.com/file/d/1GMnp3Xgd_5VxR_4GWD7JyIDxeN0FXqc/view?usp=drive_link

Video S2: A coinjection test of DI water and acid at flow rate of 10 $\mu\text{L}/\text{min}$ shows a relatively steady state is achievable.