Contribution ID: **567** Type: **Poster Presentation**

Pore-scale displacement and trapping mechanisms for underground hydrogen storage

Monday, 30 May 2022 09:40 (1h 10m)

Hydrogen will have a major role in low-carbon energy transitions, and it is vital to develop hydrogen storage facilities to accommodate widespread implementation. Underground hydrogen storage (UHS) offers a widely available large-scale and long-term storage option, but this storage technology lacks experimental efforts of multiphase hydrogen flow. We use microfluidics to experimentally describe pore-scale hydrogen-water flow behavior in porous media, previously unaddressed by scientific community. Under imbibition experiments we report the effect of capillary number on displacement and trapping mechanisms and quantify dissolution kinetics. We observe that hydrogen displacement is mainly controlled by I1 imbibition mechanism, whereas hydrogen residual trapping is triggered by I2 imbibition mechanism. Dissolution trapping initiates after residual trapping and is governed by one- and two-end dissolution processes. Hydrogen bubble dissolution kinetics show dependency on injection rate and bubble size. Dissolved global hydrogen concentration corresponds to 7-56 % of literature hydrogen solubility, indicating pore-scale non-equilibrium dissolution. Our results provide key UHS experimental data to enhance understanding of hydrogen flow behavior in porous media.

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Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

In person

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