Contribution ID: **164** Type: **Oral Presentation**

Flow field tomography identifies and quantifies pore opening and clogging in sandstones

Tuesday, 14 May 2024 12:45 (15 minutes)

Fluid-rock interactions drive changes in porosity and permeability. This has important consequences for the flow field development in the complex porous material and thus controls the evolution of reactive transport processes. Important applications are in the vast field of reservoir rock alteration, e.g. by coupled dissolution and precipitation processes. While dissolution processes can cause local increases in pore space and permeability, they can also lead to pore throat blockage, which can cause formation damage due to precipitation reactions and particle retention in pore throats. Although these mechanisms are understood in principle, the direct changes in the flow field they cause are difficult to observe directly. Using positron emission tomography (PET), we show how flow field heterogeneities are quantitatively affected by the coupling of dissolution reactions and pore throat blockage by particles in a long-term experiment.

Specifically, we performed a dissolution experiment focusing on calcite cement in sandstones. While dissolution is responsible for a local increase in pore space, mobilized iron oxide and sheet silicate colloids are trapped and cause a local decrease in permeability. Direct comparison of sequences of PET-derived flow field data reveals a pattern of flow field modification during this experiment. PET thus becomes a key analytical tool to localize and quantify pore-scale flow field changes, in addition to recent advances focused on the identification of flow channeling effects of advective flow [1]and on the heterogeneity of diffusive flux in low permeability rocks [2].

1. Pingel, J. L.; Kulenkampff, J.; Jara-Heredia, D.; Stoll, M.; Zhou, W.; Fischer, C.; Schäfer, T., In-situ flow visualization with Geo-Positron-Emission-Tomography in a granite fracture from Soultz-sous-Forêts, France. Geothermics 2023, 111, 102705.
2. Bollermann, T.; Yuan, T.; Kulenkampff, J.; Stumpf, T.; Fischer, C., Pore network and solute flux pattern analysis towards improved predictability of diffusive transport in argillaceous host rocks. Chemical Geology 2022, 606, 120997.

Acceptance of the Terms & Conditions

Click here to agree

Student Awards

Country

Deutschland

Porous Media & Biology Focused Abstracts

References

Conference Proceedings

I am not interested in having my paper published in the proceedings

Primary author: FISCHER, Cornelius (Helmholtz-Zentrum Dresden-Rossendorf)

Co-authors: SCHABERNACK, Jonas (Helmholtz-Zentrum Dresden-Rossendorf); KULENKAMPFF, Johannes (Helmholtz-Zentrum Dresden-Rossendorf)

Presenter: FISCHER, Cornelius (Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: MS10

Track Classification: (MS10) Advances in imaging porous media: techniques, software and case studies