#### InterPore2022



Contribution ID: 515

Type: Oral Presentation

# Characterisation of hydrocarbon bio-degradation in porous media

Tuesday, 31 May 2022 12:00 (15 minutes)

In the context of bio-remediation of residual hydrocarbons in soils, we seek to understand the kinematics of mass exchange amongst the different phases of a polluted soil system namely the aqueous, oil or Non-Aqueous Phase Liquid (NAPL) and biofilm phases. In this work, we ran biodegradation experiments in 2D water-saturated porous media within which a residual NAPL phase has been established. As porous medium, we used a micro-fabricated epoxy photoresist (SUEX) network consisting of a disordered array of 160 µm diameter cylinders. This material was chosen as it allows experiments with organic compounds as well as being bio-compatible and transparent. After establishment of an irreducible decane (C10) saturation, the micromodel is inoculated with an indigenous P. Fluorescens strain isolated from a French polluted site. Experiments are run for 2 - 4 weeks under continuous flow of air-saturated, minimal mineral medium as we follow the temporal evolution of the three phases by bright and dark-field microscopy. We observe how the biofilm colonises the pore space in accordance with preferential flow paths, how it develops around the NAPL phase being the sole carbon source and how bio-clogging induces redistribution of a partially degraded NAPL phase. After sophisticated image processing, several metrics distribution concerning the NAPL and biofilm phases are acquired such as volumes, contact angles and dimensions of NAPL ganglia along with biomass, biofilm type (agglomerate or streamer) and available surface area for mass exchange amongst the different phases. Analysis of the temporal evolution of these specific parameters' distributions unlocks multiple insights for the understanding of transport phenomena in such complex multi-phase systems.

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### References

#### **Time Block Preference**

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

## Participation

Online

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Session Classification: MS06-B

Track Classification: (MS06-B) Interfacial phenomena in multiphase systems