Contribution ID: **466** Type: **Poster Presentation**

Decontamination-induced contaminant redistribution in porous media

Wednesday, 1 June 2022 14:50 (1h 10m)

The cleaning of porous media is ubiquitous and the difficulties associated with cleaning such materials are numerous. Surface contamination may ingress inside the pore space and become inaccessible to a cleaning flow. This makes it very difficult to monitor the levels of contamination throughout the medium and determine whether cleaning has been successful. The addition of a surface washing flow can also encourage spreading of contaminant over the surface of porous material. These problems are exacerbated in a military or industrial context since leaving hazardous residual contamination inside the porous medium can pose significant risks to human health and the environment.

To explore the decontamination process in porous media, we propose a simple two-dimensional model for a washing flow over the surface of a wet porous medium contaminated by a drop of a single-species contaminant. We impose a single-phase unidirectional flow through the porous medium and model the washing flow using a linear shear velocity profile. At the interface, we assume that the flow fields match by definition so that interfacial boundary conditions for the velocity are not required. We construct a coupled mass transport problem to monitor the concentration of contaminant in both the washing flow and the porous medium. In both phases, we assume that mass transfer is governed by advection and diffusion processes with the addition of dispersion effects in the porous medium. We focus our analysis on asymptotic regimes that exhibit contaminant redistribution in the porous medium and consider how the efficiency of the decontamination process can be improved by variation of the problem's dimensionless parameters. We also present comparisons with numerical simulations performed in COMSOL to validate our analytical model.

Acceptance of the Terms & Conditions

Click here to agree

MDPI Energies Student Poster Award

Yes, I would like to submit this presentation into the student poster award.

Country

United Kingdom

References

Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

Unsure

Primary author: BUTLER, Emily

Co-authors: CONTO', Francesco Paolo (University of Cambridge); ETZOLD, Merlin Aragon (DAMTP, University of Cambridge); Prof. DALZIEL, Stuart (University of Cambridge); Dr DAOU, Joel (University of Manchester); Dr LANDEL, Julien (University of Manchester)

Presenter: BUTLER, Emily

Session Classification: Poster

Track Classification: (MS16) Fluid Interactions with Thin Porous Media