Contribution ID: **941**

Type: **Oral Presentation**

Irreversible processes, inertial effects, and collective filling in geometries of increasing complexity

Wednesday, 24 May 2023 12:45 (15 minutes)

Today experimental and computational resources allow visualizing transport phenomena in idealized or more realistic pore geometries and modeling these processes starting from the first principles of continuum mechanics (i.e., solving momentum- and mass-conservation equations by means of tools borrowed from classic Computational Fluid Dynamics).
We briefly introduce these computational methods, which have become increasingly popular over the last decade, and focus on the Volume Of Fluid method, which has been validated against multiphase-flow experiment in pseudo two dimensional porous media [1] and has been used to elucidate the relationship between capillary pressure and the total surface energy of the system [2].
Then, we investigate the role of local inertial effects in influencing the morphology of the invading front [3]. We pay particular attention to the characterization of abrupt events, to collective pore filling, and to the effects of geometries of increasing complexity [4]. We discuss how local inertial effects, resulting from surface energy instabilities and subsequent spontaneous reconfiguration of the interface, cannot be avoided and how these processes are at the basis of hysteresis.

Participation

In-Person

References

[1] Ferrari et al., Challenges in modeling unstable two-phase flow experiments in micromodels, Water Resources Research, 51(3), 1381–1400, 2015
[2] Ferrari, A., and I. Lunati, Direct numerical simulations of interface dynamics to link capillary pressure and total surface energy, Advances in Water Resources, 57, 19–31, 2013
[3] Ferrari, A., and I. Lunati, Inertial effects during irreversible meniscus reconfiguration in angular pores, Advances in Water Resources, 74, 1–13, 2014
[4] Ferrari, A., and I. Lunati, Irreversible processes, inertial effects, and collective filling in geometries of increasing complexity, 2016 (unpublished)

MDPI Energies Student Poster Award

No, do not submit my presenation for the student posters award.

Country

Switzerland

Acceptance of the Terms & Conditions

Click here to agree

Energy Transition Focused Abstracts

Primary author: Dr LUNATI, Ivan (Empa)

Co-author: FERRARI, Andrea (ENI)

Presenter: Dr LUNATI, Ivan (Empa)

Session Classification: MS06-B

Track Classification: (MS06-B) Interfacial phenomena across scales