PoreLab

NTNU
Norwegian University of Science and Technology
UiO
University of Oslo

Newsletter 1- 2018

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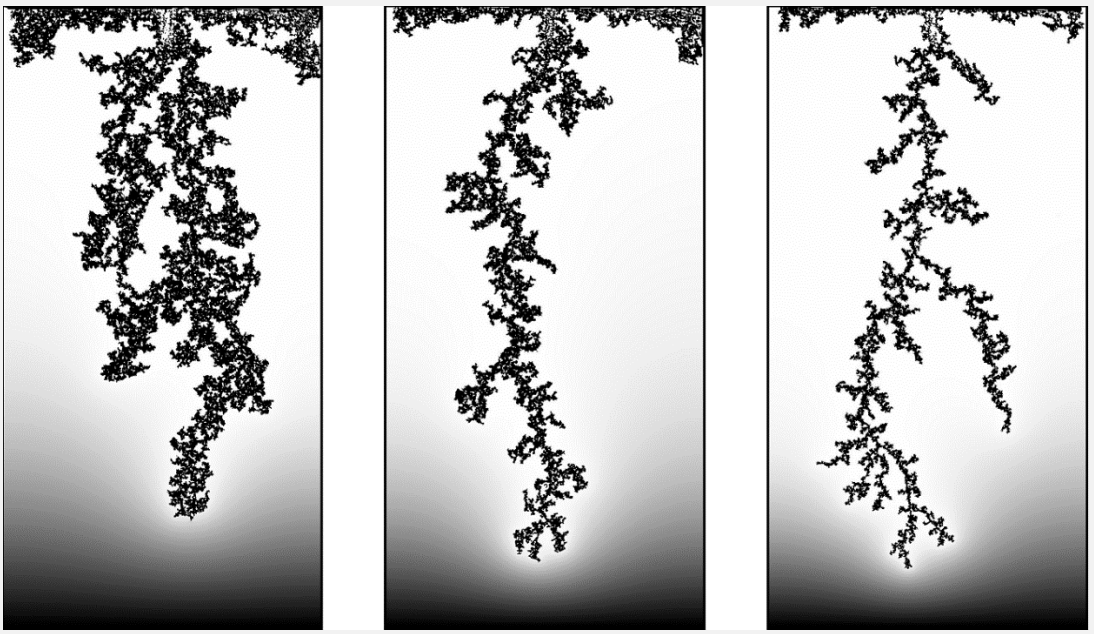


PoreLab
NTNU-UiO Porous Media Laboratory

Norwegian Centre of Excellence
The Research Council of Norway

NTNU
Norwegian University of Science and Technology

UiO : University of Oslo

News

New associate member

The Department of Civil and Environmental Engineering is now an associate member of PoreLab. Our employee there is Dr. Seyed Amiri.

Conferences

Signe is invited speaker in University of Stuttgart 5th – 9th February.

April 16-20 the Norwegian Minister of Education and Research will visit his counterpart in China.

In this context, PoreLab will organize a workshop that highlights Chinese-Norwegian cooperation. Our representatives in China are Alex, Eirik and Bjørn. In addition, we collaborate with Center of Quantum Spintronics at NTNU. Her fra Universitetsavisen.

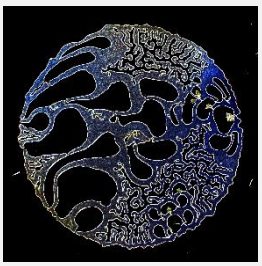
PoreLab will edit a volume of Frontiers in Physics

PoreLab will edit a volume of Frontiers in Physics dedicated to the Physics of Porous Media mixing research and review articles.

30 year old prediction on motion of fluids is verified

- By using synthetic porous samples and modern image analysis techniques, we have been able to finally verify those predictions experimentally, says Marcel Moura at PoreLab. They have just had an article accepted for publication in the prestigious journal Physical Review Letters (PRL). Read the article here.

The Gallery of Porous Media Art, by Marcel Moura, Postdoctoral Fellow



NEWLY PUBLISHED ARTICLES

Atomistic Insights into the Nanofluid Transport through Ultra-confined Capillary

Wang, Xiao; Zhang, Zhiliang; Torsæter, Ole; He, Jianying. Physical Chemistry, Chemical Physics - PCCP 2018. Nanofluid or nanoparticle (NP) transport in confined channels is of great importance for many biological and industrial processes. In this study, molecular dynamics simulation has been employed to investigate the spontaneous two-phase displacement process in an ultra-confined capillary controlled by the surface wettability of NPs. The results clearly show that the presence of NPs modulates the fluid–fluid meniscus and hinders the displacement process compared with the NP-free case. Read the paper here.

Rheology of High-Capillary Number Flow in Porous Media

Magnus Aa. Gjennestad,, Morten Vassvik,, Mathias Winkler, and Alex Hansen. We have studied the effective viscosity of immiscible two-fluid flow in porous media in the high capillary number limit where the capillary forces may be ignored compared to the viscous forces. We find that the Lichtenecker–Rother equation describes the effective viscosity well. The exponent depends on the fluid configuration, i.e. the number of bubbles/interfaces in the pores. For small bubbles or many interfaces in the pores, as with the Boltzmann model, we find $\alpha = 1$, whereas when the bubbles are larger or the interfaces fewer in the pores, we find $\alpha = 0.6$ in 2D (square and hexagonal lattices) and $\alpha = 0.5$ in 3D for networks reconstructed from Berea sandstone and sand packs. Our arguments are based on analytical and numerical methods. Read the paper here.

Relations between Seepage Velocities in Immiscible, Incompressible Two-Phase Flow in Porous Media

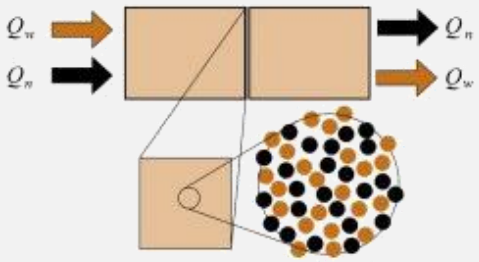


Fig. 1 In the upper part of the figure, we see the REV from the side. There is a flow $Q = Q_w + Q_n$ across it. An imaginary cut is made through the REV in the direction orthogonal to the flow. In the lower left corner, the surface of the imaginary cut is illustrated. A magnification of the surface of the cut is shown in the lower right corner. The pore structure is illustrated as brown and black circles. The pores that are brown, are filled with wetting fluid and the pores that are black, are filled with non-wetting fluid. The wetting fluid-filled pores form in total an area A_w and the non-wetting fluid-filled pores form in total an area A_n. The total pore area of the imaginary cut in the lower left corner is $A_p = A_w + A_n = A\phi$.

Alex Hansen, Santanu Sinha, Dick Bedeaux, Signe Kjelstrup, Magnus Aa. Gjennestad, Morten Vassvik. The aim of this paper is to derive a set of equations on the continuum level where differentiation make sense. We define a representative elementary volume — REV — as a block of porous material with no internal structure filled with two immiscible and incompressible fluids: it is described by a small set of parameters which we will now proceed to define. We illustrate the REV in Fig. 1. Read the paper here.

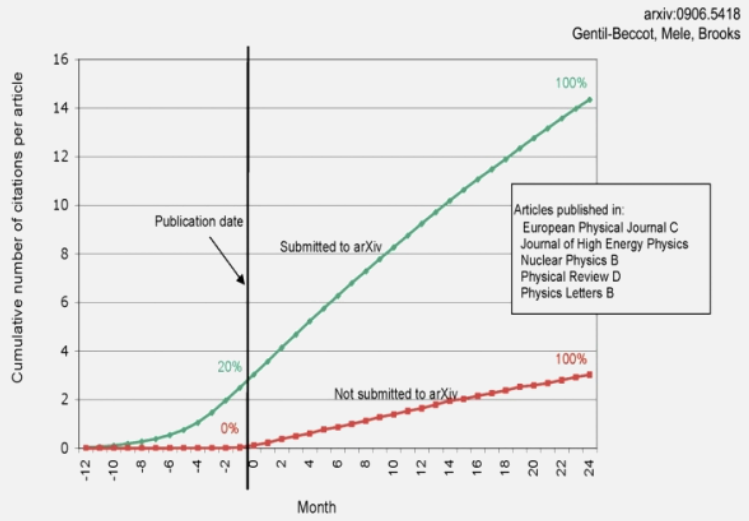
Pressure evolution and deformation of confined granular media during pneumatic fracturing

Eriksen F.K., Toussaint R., Turquet A.L., Måløy K.J., and Flekkøy E.G. By means of digital image correlation, we experimentally characterize the deformation of a dry granular medium confined inside a Hele-Shaw cell due to air injection at a constant overpressure high enough to deform it (from 50 to 250 kPa). Air injection at these overpressures leads to the formation of so-called pneumatic fractures, i.e., channels empty of beads, and we discuss the typical deformations of the medium surrounding these structures. In addition we simulate the diffusion of the fluid overpressure into the medium, comparing it with the Laplacian solution over time and relating pressure gradients with corresponding granular displacements. In the compacting medium we show that the diffusing pressure field becomes similar to the Laplace solution on the order of a characteristic time given by the properties of the pore fluid, the granular medium, and the system size. Read the paper here.

Pattern formation of frictional fingers in a gravitational potential.

Eriksen J.A., Toussaint R., Måløy K.J., Flekkøy E., Galland O., Sandnes B. Aligned finger structures, with a characteristic width, emerge during the slow drainage of a liquid-granular mixture in a tilted Hele-Shaw cell. A transition from vertical to horizontal alignment of the finger structures is observed as the tilting angle and the granular density are varied. An analytical model is presented, demonstrating that the alignment properties are the result of the competition between fluctuating granular stresses and the hydrostatic pressure. The dynamics is reproduced in simulations. We also show how the system explains patterns observed in nature, created during the early stages of a dike formation. Read the paper here.

The following graph show the advanges of systematic use of arXiv for prepublishing.



Places to meet

Visit our website at www.porelab.no

Open meetings with all the Centre's researchers are held weekly and, in addition; there are ample opportunities for scholarly engagement within the Centre through seminars and research workshops.

PoreLab Lecture series

The PoreLab Lecture series are held every Wednesday from 09:00 to 10:00. Everyone are welcome to join and contribute, remember to subscribe to receive e-mails about these seminars. Subscription: Send an e-mail to Magnus Aashammer Gjennestad at NTNU or Guillaume Dumazer at UiO.

February 7th Guillaume Dumazer, UiO, will give a talk titled "When dense suspensions are getting denser".

The PoreLab Journal Club

The PoreLab Journal Club is a club where we meet every Tuesday at 14:00 to discuss papers within the topic of porous media, chosen and presented by one of its members. All are welcome, and feel free to propose paper to discuss by contacting the administrator Mathias Winkler.

PoreLab Junior Forum

PoreLab Junior Forum is for PhD and Postdoctoral Fellows in PoreLab for them to organize their own meetings. The administrator for this forum is Marcel Moura.

Remember to sign up for the first meeting March 8!

10'o clock coffee at NTNU

Every day at 10:00 we meet for coffee in the lunchroom at the Physics department. You will find us in Realfagbygget, room D3-160.

Meet the team!

You can look up all the team members and associates at this page.

INTERPORE

October 2017 PoreLab became the newest institutional members of InterPore. InterPore offers institutional membership to academic institutes, national labs, or industrial companies.

Currently, InterPore has more than 45 institutional members. You can read about the publicity services that InterPore is offering to members here.

INTRODUCTION

In this first newsletter, there will be a short introduction to the Centre director, the principal investigators and the coordinator.

Alex Hansen

Centre Director – Professor, Department of Physics, NTNU

Knut Jørgen Måløy

Deputy Director of PoreLab, Professor, Department of Physics, UiO

Signe Kjelstrup, Principal Investigator of PoreLab.

Professor, Department of Chemistry, NTNU

Eirik Grude Flekkøy, Principal Investigator of PoreLab.

Professor, Department of Physics, UIO

Ole Torsæther, Principal Investigator of PoreLab.

Professor, Department of Geoscience and Petroleum, NTNU

Dick Bedeaux, Principal Investigator of PoreLab.

Professor, Department of Chemistry, NTNU

And I want to introduce myself. My name is Anette Havmo. I am Deputy for the administrative Head/Center Coordinator Marie-Laure Olivier.

If you have any questions, please no not hesitate to contact me. If you have attended a seminar or held a speech at a conference, please let me know. Any news for the website are most welcome. In addition, there will be a column for “Featured publications”, in the publication section.

These are some of my responsibilities:

- Assure that the Centre has a visible profile, a strong identity and a successful collaboration with its Consortium participants. I have made the webpages. Please send me any news that could fit on to the webpages. about conferences, papers, popular science, etc.
- Prepare, call, record and execute meetings of the Centre management team, Executive Board and Scientific Advisory Board.
- Help organise workshops and summer schools.
- Maintain contact with the Research Council and external collaborators
- Ensure timely reporting to the Research Council
- Ensure good communication in the Centre
- Make drafts of annual reports
- Ensure follow-up of the Contract and Consortium agreement
- Ensure budget control
- Follow up bookings and investments
- Contribute in relation to recruitment of new employees and reception of guests.