

# InterPore2022

## Hybrid

14<sup>th</sup> INTERNATIONAL CONFERENCE  
ON POROUS MEDIA



**CONFERENCE PROGRAM**  
31 May -02 June 2022  
Abu Dhabi, United Arab Emirates  
& Online

[www.interpore.org/2022](http://www.interpore.org/2022) | [conference2022@interpore.org](mailto:conference2022@interpore.org)



جامعة خليفة  
Khalifa University

Platinum Sponsors:



**Kimberly-Clark**

**ThermoFisher**  
SCIENTIFIC



أدنوك  
ADNOC

Supporting Partner:



Abu Dhabi

مكتب  
المؤتمرات  
والمعارض  
CONVENTION  
& EXHIBITION  
BUREAU



# InterPore

## ORGANIZING COMMITTEE

**Arif Sultan Al Hammadi (LOC General Chair)**

Khalifa University Executive Vice President

**Mohamed Sassi (LOC Chair)**

Khalifa University Chair, Petroleum Engineering

**Dimitrios Kyritsis (LOC Co-Chair)**

Khalifa University Chair, Mechanical Engineering

**Sayed Alhashmi (LOC Co-Chair)**

Khalifa University Director, Marketing & Communication

**Waleed Alameri**

*Khalifa University* Petroleum Engineering

**Mohamed Al-Shehhi**

Khalifa University Mechanical Engineering

**Eyad Zerba**

Khalifa University Marketing Specialist

**Emad Al-Shalabi**

Khalifa University Petroleum Engineering

**Hamid Ait Abderrahmane**

Khalifa University Mechanical Engineering

**Ebrahim Al-Hajri**

Khalifa University Senior Vice-President, Support Services

**Muhammad Arif**

Khalifa University Petroleum Engineering

**Mohammed Motiur Rahman**

Khalifa University Associate-Chair, Petroleum Engineering

**Valérie Evely**

Khalifa University Mechanical Engineering

**Afshin Goharzadeh**

Khalifa University Mechanical Engineering

**Tiejun (TJ) Zhang**

Khalifa University Mechanical Engineering

**Sofiane Benna**

Khalifa University Director, Technology Operations

**Muna Al-Hammadi**

Khalifa University SPE Student Chapter President

**Mohammed Tamini**

Khalifa University ASME Student Chapter President

**Omeer Al-Marzouqi**

Khalifa University SPE Student Chapter Vice-President

*We are so glad to welcome you!*



# InterPore

## PROGRAM COMMITTEE

**Patrick Jenny (Chair)**, *ETH Zürich, Switzerland*

**Sridhar Ranganathan (Vice Chair)**, *Kimberly-Clark Corporation, United States*

**Goodarz Ahmadi**, *Clarkson University, USA*

**Matthias Appel**, *Shell Global BV, The Netherlands*

**Inga Berre**, *Bergen University, Norway*

**Anozie Ebigbo**, *ETH Zürich, Switzerland*

**Roseanne Ford**, *University of Virginia, USA*

**Sebastian Geiger**, *Heriot-Watt University, UK*

**Gennady Gor**, *New Jersey Institute of Technology, USA*

**Bo Guo**, *University of Arizona, USA*

**Tiina Roose**, *University of Southampton, UK*

**Hamdi Tchelepi**, *Stanford University, USA*

**Stéphane Zaleski**, *University Pierre and Marie Curie, France*

## EVENTS COMMITTEE

**Oleg Iliev (Chair)**, *Fraunhofer Institute for Industrial Mathematics, ITWM, Germany*

**M. Sadegh Riasi (Short Courses)**, *University of Cincinnati, USA*



*We are so glad to welcome you!*

# WELCOME MESSAGES

## Welcome to Khalifa University

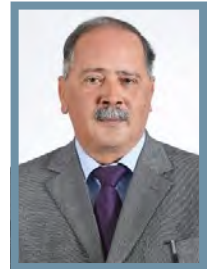


**Arif Sultan Al Hammadi**  
*Khalifa University*

We are delighted to host the InterPore2022 Conference and highlight the latest research outcomes in porous media applications. We believe the gathering of leading experts in porous media will help emphasize the essential role of Abu Dhabi and the UAE in bringing innovations to the oil and gas industry.

**Dr. Arif Sultan Al Hammadi**  
*General Chair, InterPore2022,  
and Executive Vice-President, Khalifa University*

We are excited to host this conference and it will offer an exciting opportunity to engage with the wider scientific community and extend research network and collaboration among stakeholders. Our Petroleum Engineering Department at Khalifa University is currently ranked 20th in the world, and we look forward to widening our contribution to the relevant scientific community through this event. We hope all participants will have a wonderful experience at this conference. I also take this opportunity to thank our Local Organizing Team comprising of our Faculty and Students for their dedication to make this event possible.



**Mohamed Sassi**  
*Khalifa University*

**Dr. Mohamed Sassi**  
*Chair of the InterPore2022 Local Organizing Committee  
and Professor & Acting Department Chair,  
Petroleum Engineering, Khalifa University*



College of  
Arts & Science

College of  
Engineering

College of  
Medicine &  
Health Science

## LEADERS IN RESEARCH

The highly-ranked Khalifa University offers fully accredited degrees to all nationalities through its 3 academic colleges, including 16 Bachelor's degree programs, 20 Master's degree programs, 5 PhD programs and a Doctor of Medicine (MD) program. We offer plenty of opportunities for students to explore their interests and learn from award-winning teachers. We also offer our graduate students full scholarships that cover tuition, housing, and an attractive monthly stipend.

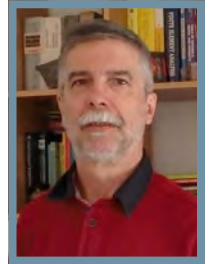
As Abu Dhabi's research-intensive university, Khalifa University gives students a chance to study in-depth with expert faculty and researchers on the leading-edge of discovery in science, engineering and medicine to solve real-world problems. Our students help develop cleaner energy, find new ways to produce water sustainably, create smarter diagnostic tools, and discover better ways to use AI to make data insightful.

Study beside our award-winning faculty and help deliver real solutions, transform lives and change the world.

# WELCOME MESSAGES

Dear Colleagues,

On behalf of the Executive Committee, I welcome you to the 14th International Conference on Porous Media and Annual Meeting of the International Society for Porous Media (InterPore). We are pleased that you can join us for this multidisciplinary international meeting that brings together colleagues from the global porous media community. The Conference presentations include new and exciting advances in porous media studies that cut across disciplines and span from fundamental science to applications, using new experimental methods, machine learning and advanced computational simulation and analysis.



**Michel Quintard**  
*CNRS, Institut de  
Mécanique des  
Fluides de Toulouse*

For two years, we had to organize InterPore Conferences as pure online events. InterPore, Committees and members did a very good and successful job to undertake such a challenge. While the COVID-19 pandemic is not still completely under control, it was possible to consider organizing this year's conference as a hybrid conference. InterPore is deeply grateful to Khalifa University for its offer to host the 2022 InterPore Annual Conference. Efficient work of the local organizers, plus InterPore staff's and participants' acquired competences in the organization of online events, will no doubt make this new hybrid experience a great success.

Indeed, the Conference could not have happened without the effort and dedication of many people who worked tirelessly on short notice. The local organizers, under the leadership of Dr. Arif Sultan Al Hammadi and Dr. Mohamed Sassi, did an incredible job to offer such a magnificent and practical venue. The hard work of moderators and minisymposia organizers, the Program Committee, the Organizing Committee, Communication Committee, and InterPore's executive staff is greatly appreciated.

Thank you for participating in InterPore2022. Please enjoy the conference, learn as much as you can, meet and make friends, physically or virtually. All kinds of opportunities are available to participants to make InterPore2022 a thriving and fruitful Conference.

On behalf of the executive committee,

Michel Quintard  
President of InterPore

# WELCOME MESSAGES



**Patrick Jenny**  
*ETH Zürich*

It is our great pleasure to welcome you on behalf of the Program Committee. We're extremely glad that unlike at InterPore2020 and InterPore2021 it's possible again to meet in person, that is, the conference will take place in hybrid mode. Thanks to the large number of excellent oral and poster presentations, we once more can present an exciting and diverse program. Without the hard work of mini-symposia organizers, who have played a major role since late last year and whose work will continue as session moderators during the conference, this would have not been the case. We also want to mention the very constructive interaction with the Executive and Local Organizing committees and the great support by the InterPore Office. The success of InterPore also heavily relies on the individual members who volunteer and participate in scientific and organizational activities.



**Sridhar Ranganathan**  
*Kimberly-Clark  
Corporation*

Hybrid conferences with the option of online presentations are challenging, but do offer new possibilities and allow some to attend and present their work who can't travel for various reasons (such as lack of funds). But of course we hope to meet many of you in person and hope you will enjoy the conference.

*Patrick Jenny and Sridhar Ranganathan  
Program Committee Chair & Vice-Chair*

National chapters offer elevated visibility, improved local and global networking, platforms for joint workshops and many other benefits.

## Existing Chapters



Australia



Benelux



Brazil



Columbia



China



France



Germany



India



Iran



Israel



Italy



Mexico



Norway



Saudi Arabia



Spain



United Kingdom



Southern US



Midwest &  
Northeast US

## Chapters Under Formation include:

West Africa, Maghreb, Greece, Denmark, Austria & Japan

### InterPore National Chapter Committee Members:

Maja Rucker, Technical University of Eindhoven, *The Netherlands*

Eduardo Abreu, University of Campinas, *Brazil*

Michel Quintard, CNRS, IMFT, *France*

Nicolae Tomozeiu, Canon Production Printing, *The Netherlands*

Xiaofan Yang, Beijing Normal University, *China*

Didier Lasseux (Chair), CNRS, I2M, *France*

**Visit the National Chapters online booth to learn more about joining or starting your local chapter!**



In response to the excellent participation in the previous years' conferences, The Student Affairs Committee (SAC) will organize a Career Development Event (with four esteemed speakers) and a Laboratory Tour (in collaboration with LOC) during the InterPore2022. The SAC activities are **free of charge and open to all participants from all career stages**, from undergraduate students to early career researchers and even experienced researchers/professors! They form a perfect setting for you to get to know the International Society of Porous Media (InterPore) better, expand your professional network, and get inspired to become more involved with the student-focused activities at the national and global level. The students also have the chance to learn more about InterPore Young Academy and Porous Media Tea Time Talks (PorousMediaTTT) live webinars. Come along!

You can find more information on these events in the detailed program.

## InterPore SAC 2022 Board Members

### Chair

Mohammad Nooraiepour  
University of Oslo,  
Norway



### Vice-Chair

Marco Sauermoser  
Norwegian University  
of Science and  
Technology, Norway



### Events Manager and Financial Advisor

Neerja Zambare  
Montana State  
University, USA



### Secretary and Communication Advisor

Manuela Bastidas  
Olivares  
Inria, Paris, France



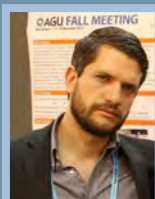
### Events Director

Nara Brandao Costa  
Federal University of  
Uberlândia, Brazil



### Communication Officer

Javier E. Santos  
The University of  
Texas at Austin, USA



### Communication Officer

Cunqi Jia  
University of  
Petroleum,  
China



Would you like to join SAC and make InterPore2022 even better?  
Contact [sac@interpore.org](mailto:sac@interpore.org)



In support of the outreach activities, one goal of the Foundation is to facilitate the participation of promising **young scientists** in **international scientific gatherings** and support outstanding young scientists from **countries with financial difficulties** in joining InterPore activities.



Since 2018, the InterPore Foundation has provided a **total of 70 conference grants** to students and young scientists. The Foundation aims to increase both the number and amount of these grants for the coming years.

[Visit our booth in the virtual exhibition hall](#) to learn more about the Foundation and how your contributions count!

**Make all this possible -  
DONATE NOW!**



Promoting InterPore educational and training activities via:

- **Short courses**
- **Webinars**
- **Thematic workshops**
- **Young Academy activities**

[Visit our virtual booth](#) to learn more about upcoming events & suggest topics and lecturers!

### InterPore Academy Governance:

**Director:** Brian Berkowitz, Weizmann Institute of Science, *Israel*

**Scientific Secretary:** M. Sadegh Riasi, University of Cincinnati, *USA*

**Chair of Webinar Committee:** Holger Steeb, University of Stuttgart, *Germany*

**Chair of Short Course Committee:** Ilenia Battiato, Stanford University, *USA*

**Chair of Thematic Workshop Committee:** Yongfei Yang, China University of Petroleum, *China*

**Co-Chair of the Young Academy:** Marcel Moura, University of Oslo, *Norway*

### Young Academy Team

Sarah  
Perez



Mohammad  
Nooraiepour



Catherine  
Spurin



Marcel  
Moura



Kamaljit  
Singh



Federico  
Lanza



Nara Brand o  
Costa Santos



Javier  
Santos



# THANKS TO OUR SPONSORS

---

## PLATINUM



## GOLD



## SILVER



## BRONZE

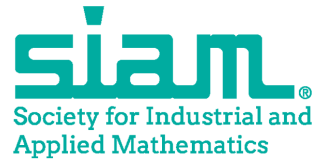


## SUPPORTING PARTNER

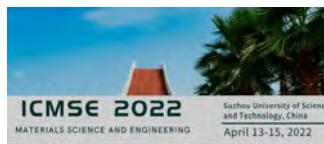


مكتب  
المؤتمرات  
والمعارض  
CONVENTION  
& EXHIBITION  
BUREAU

# InterPore2022 is also supported by:



# InterPore2022 Partner Events:



# VISIT OUR EXHIBITORS

## **Thermo Fisher** S C I E N T I F I C

**Booth #1**  
**& Whova Virtual Exhibition**

Thermo Fisher Scientific is the world leader in serving science. Our mission is to enable our customers to make the world healthier, cleaner and safer.

With Thermo Scientific™ PerGeos and Avizo™ Software, we provide a complete solution from data acquisition to visualization, analysis and simulation helping you to solve complex natural and industrial porous media systems challenges.

**[www.thermofisher.com/pergeos](http://www.thermofisher.com/pergeos)**



**Booth #4**  
**& Whova Virtual Exhibition**

micro-CT: unmatched speed, quality, and versatility. Identify and match events in real time. Offering real-time, complex in-situ dynamic micro-CT capabilities, recording and visualizing a multitude of physical processes — compression, torsion, tension, flow, heating, cooling, growth of forms, dissolution of liquids and many other dynamic events. With micro-CT technology, you can achieve the following results:

- 1) Boost sample throughput with superior imaging speed
- 2) Protect your investment with our modular micro-CT systems
- 3) No sample is too complex with the extreme versatility a micro-CT can offer

TESCAN offers a wide range of micro-CT products, including the UniTOM HR for sub-micron spatial resolution and high temporal resolution dynamic CT in a single system, and the UniTOM XL for multi-scale, high temporal resolution 3D imaging. Speak with one of our experts to find out more!

**[www.tescan.com](http://www.tescan.com)**

# VISIT OUR EXHIBITORS



**Booth #3  
& Whova Virtual Exhibition**

As a leading manufacturer of microscopes for more than 175 years, ZEISS offers inspiring solutions for your research. ZEISS microscopes for understanding pore structures enable you to gain insights into your porosity across length scales. Offering a suite of modalities for a variety of materials.

- Acquire pore-scale information based on macroscopic heterogeneity for quantitative upscaling of reservoirs.
- Characterize porosity, voids, and phases in 2D and 3D to design your desired microstructure and flawless ceramic parts.
- Understand gas transport in fuel cells, or lithium-ion transport in batteries, from the bulk phase down to submicron scale, with 3D tomographic imaging from tens of microns to the nanoscale.
- Solve typical imaging problems for sub-micron foam porosity of low-Z polymers, studying in situ to understand load-bearing and structural applications.

**[Zeiss.com/microscopy](https://zeiss.com/microscopy)**



**Whova Virtual Exhibition**

Our efforts are focused on providing solutions to the energy and climate challenges that society and industry are facing. Our field of activity extends from scientific concepts within the framework of fundamental research, through technological solutions in the context of applied research.

We are pleased to present our scientific journal **STET**, jointly supported with CEA. STET addresses all topics related to the ecological transition, and welcomes submissions from academic and industrial researchers. STET is an open-access WoS journal without APC.

**[www.ifpenergiesnouvelles.com](https://www.ifpenergiesnouvelles.com)**

# VISIT OUR EXHIBITORS



**Booth #2  
& Whova Virtual Exhibition**

HOT Microfluidics was founded in 2017 to consolidate the HOT Energy Group's microfluidic solutions expertise developed in collaboration with leading university and research associations.

InspIOR, our reservoir condition microfluidic flooding system, is a turnkey "ready-to-use" professional device to investigate subsurface fluid flow.

The many challenges related to the energy transition and reducing greenhouse gases have led us to focus on lab services and fluidic systems.

Our services and products concentrate on IOR/EOR, underground gas & hydrogen storage and CCS in compliance to highest HSE regulations.

**<https://fluidicslab.com>**



**Whova Virtual Exhibition**

How can you ensure that your designs will perform as expected in the real world? Simulate real-world designs, devices, and processes with the COMSOL Multiphysics® software. COMSOL Multiphysics® is a general-purpose simulation software based on advanced numerical methods.

**[www.comsol.com](http://www.comsol.com)**



***computation***

an Open Access Journal by MDPI

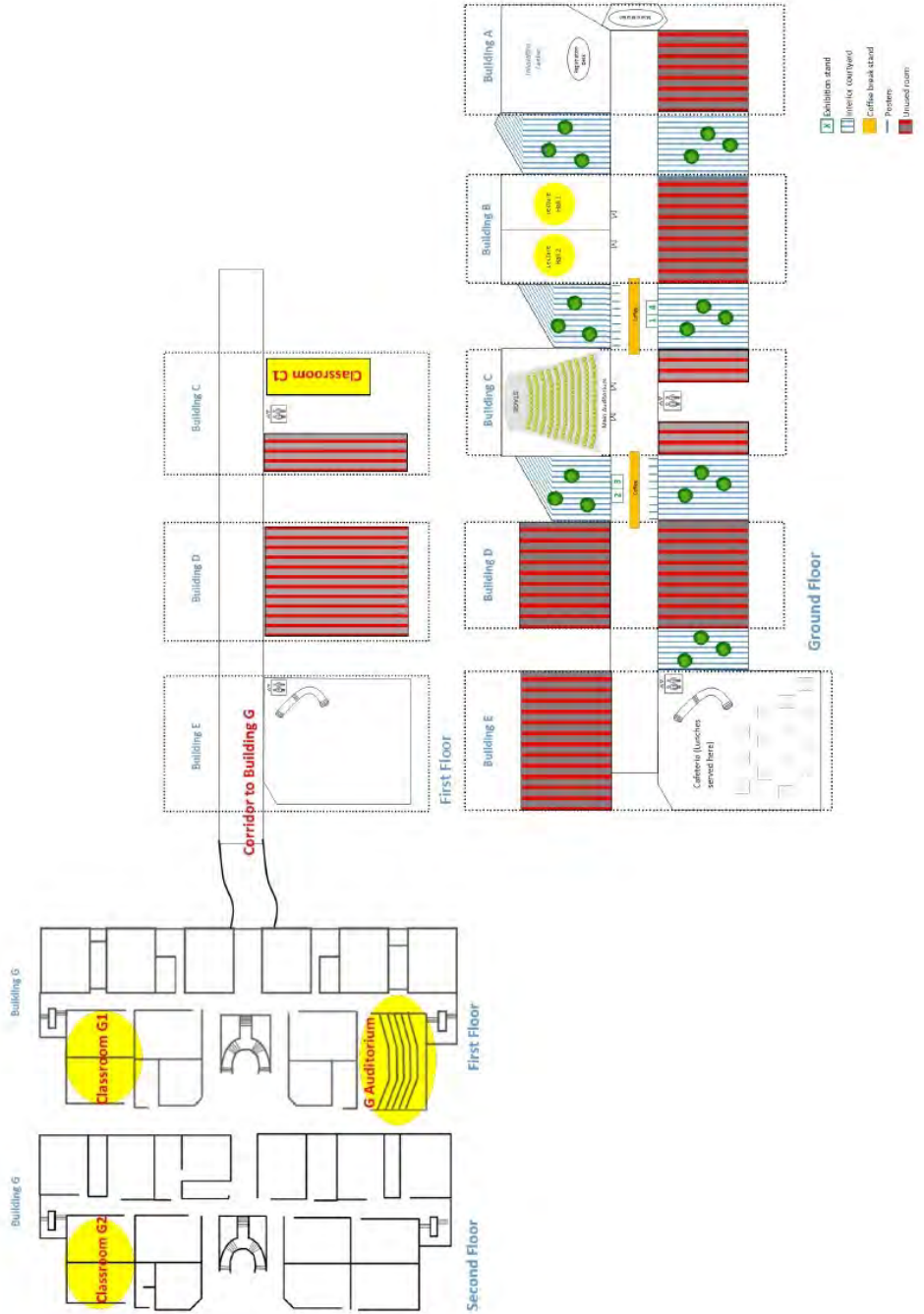
**Whova Virtual Exhibition**

Computation (ISSN 2079-3197) is a peer-reviewed journal of computational science and engineering published monthly online by [MDPI](http://MDPI). Computation publishes reviews, regular research papers, and communications, and there is no restriction on the length of the papers. Manuscripts regarding research proposals and research ideas will be particularly welcomed.

**[www.mdpi.com/journal/computation](http://www.mdpi.com/journal/computation)**



# VENUE FLOORPLAN



# LIST OF MINI SYMPOSIA

## (MS01) Porous Media for a Green World: Energy & Climate

**Organizers:** Hamed Aslannejad, Lauren Beckingham, Maartje Boon , Brian Ellis, Anna Herring, William Rossen , Eleni Stavropoulou

---

## (MS02) Porous Media for a Green World: Water & Agriculture

***Dedicated to Sjoerd van der Zee in recognition of his scientific achievements***

**Organizers:** Li Chen, Amirhossein Hassani, Steven Jansen , Nima Shokri , Jan Vanderborght, Jun Yin

---

## (MS03) Flow, transport and mechanics in fractured porous media

**Organizers:** Olav Moyner, Hamid Nick, Holger Steeb, Hongkyu Yoon

---

## (MS04) Swelling and shrinking porous media

**Organizers:** Daniel Markl, Chris McMinn, Sridhar Ranganathan

---

## (MS05) Biochemical processes and biofilms in porous media

**Organizers:** Anozie Ebigbo, Roseanne Ford, Valentina Prigiobbe, Eleonora Secchi

---

## (MS06-A) Physics of multi-phase flow in diverse porous media

**Organizers:** Ryan Armstrong, Saman Aryana, Carl Fredrik Berg, Yaniv Edery, Ying Gao, Signe Kjelstrup

---

## (MS06-B) Interfacial phenomena in multiphase systems

**Organizers:** Eduardo Abreu, Grigori Chapiro, Ran Holtzman, Matteo Icardi, Bjornar Sandnes

---

## (MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

**Organizers:** Jakub Both, Carina Bringedal, Michel Kern, Shuyu Sun

---

## (MS08) Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

**Organizers:** Branko Bijeljic, Marco Dentz, Mozhdeh Sajjadi, Amir Raouf, Qingwang Yuan

---

## (MS09) Pore-scale modelling

**Organizers:** Bo Guo, Yashar Mehmani, Ke Xu, Yongfei Yang, Stéphane Zaleski

---

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

**Organizers:** Martin Blunt, Marijn Boone, Matthijs de Winter, Eseosa Ekanem, Maja Rucker, Liwei Zhang

---

# LIST OF MINI SYMPOSIA

(MS11) Microfluidics and nanofluidics in porous systems

**Organizers:** Florian Doster, Hossein Hejazi, Hassan Mahani, Sophie Roman

---

(MS12) Advances in modeling and simulation of poromechanics

**Organizers:** Jianchao Cai, Xiaozhe Hu, Florin A. Radu, Joshua White

---

(MS13) Fluids in Nanoporous Media

**Organizers:** Elizabeth Barsotti, Ahmad Sakhaee-Pour, Erkin Şeker

---

(MS14) Uncertainty Quantification in Porous Media

**Organizers:** Marcio Borges, Felipe Pereira, Arunasalam Rahunanthan, Fabricio Sousa

---

(MS15) Machine Learning and Big Data in Porous Media

**Organizers:** Bailian Chen, Patrick Huber, Teeratorn Kadeethum, Jianchun Xu, Hongkyu Yoon

---

(MS16) Fluid Interactions with Thin Porous Media

**Organizers:** Divesh Bhatt, Richmond Cohen, Satoru Katoh, Chaozhong Qin

---

(MS17) Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

**Organizers:** Moran Wang, Huijin Xu, Peng Zu, Ruina Xu, Yingfang Zhou

---

(MS18) Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers

**Organizers:** Carlo Bianco, Sujit Datta, Jaime Gomez-Hernandez, Tannaz Pak

---

(MS19) Electrochemical processes in porous media

**Organizers:** Jeff Gostick, Qingyang Lin, Pablo Garcia Salaberri, Iryna V. Zenyuk

---

(MS20) Biophysics of living porous media: theory, experiment, modeling and characterization

**Organizers:** Tobias Koepl, Dominik Obrist, Fred Vermolen

---

(MS21) Non-linear effects in flow and transport through porous media

**Organizer:** Vittorio Di Federico, Yves Méheust, Mohaddeseh Mousavi Nezhad, Bjornar Sandnes

---

(MS22) Manufactured Porous Materials for Industrial Applications

**Organizer:** Senyou An, Oleg Iliev, Vahid Niasar

---

(MS23) Special session in honor of Brian Berkowitz

**Organizer:** Alberto Guadagnini, Martin J. Blunt

---

# SUNDAY, 29 MAY 2022

<b>18:30 – 21:00</b>	<p align="center"><b>Welcome Reception:</b> Main Auditorium &amp; Exhibition Area</p> <p align="center">Welcoming Speeches (18:30 – 18:40)</p> <p align="center">InterPore Rosettes (18:40 – 18:50)</p>
----------------------	---

# MONDAY, 30 MAY 2022

<b>8:45 – 08:50</b>	<p align="center"><b>Plenary Session:</b> Main Auditorium</p> <p align="center"><b>Opening Ceremony</b></p>					
<b>8:50 – 09:00</b>	<p align="center"><b>Awards Ceremony</b></p> <p align="center">InterPore Meritorious Service Medal: <i>Azita Ahmadi-Senichault</i></p>					
<b>9:00 – 09:40</b>	<p align="center"><b>Plenary Lecture:</b> Adam Weber</p>					
<b>9:40 – 10:50</b>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>					
<b>10:50 – 12:20</b>	<p align="center"><b>Parallel Oral Sessions 1</b></p>					
<b>MS18</b>	<b>MS06-A</b>	<b>MS11</b>	<b>MS21</b>	<b>MS10</b>	<b>MS08</b>	
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	
<b>12:20 – 13:30</b>	<p align="center"><b>Lunch</b></p>					
<b>13:30 – 13:35</b>	<p align="center">Lecture Hall 1</p>			<p align="center">Lecture Hall 2</p>		
<b>13:35 – 14:05</b>	<p align="center"><b>Learn about COMSOL</b></p> <p align="center"><b>Invited Lecture:</b> Vahid Niasar</p>			<p align="center"><b>Learn about ZEISS</b></p> <p align="center"><b>Invited Lecture:</b> Stephan Matthai</p>		
<b>14:10 – 15:10</b>	<p align="center"><b>Parallel Oral Sessions 2</b></p>					
<b>MS18</b>	<b>MS06-B</b>	<b>MS11</b>	<b>MS17</b>	<b>MS14</b>	<b>MS08</b>	
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	
<b>15:10 – 16:20</b>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>					
<b>16:20 – 18:05</b>	<p align="center"><b>Parallel Oral Sessions 3</b></p>					
<b>MS02</b>	<b>MS06-B</b>	<b>MS09</b>	<b>MS17</b>	<b>MS14</b>	<b>MS16</b>	
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	
<b>18:10 – 20:10</b>	<p align="center"><b>Lab Tours</b> (<i>more information on page 58</i>)</p>					

# TUESDAY, 31 MAY 2022

<p><b>8:30 – 8:40</b></p> <p><b>8:40 – 9:20</b></p>	<p align="center"><b>Plenary Session: Main Auditorium</b></p> <p align="center"><b>Awards Ceremony</b></p> <p align="center">Honorary Lifetime Membership Award: <i>Signe Kjelstrup</i></p> <p align="center">Kimberly-Clark Distinguished Lectureship Award: <i>Adrian Bejan</i></p> <p align="center"><b>Plenary Lecture: Laura De Lorenzis</b></p>																	
<p><b>9:20 – 10:30</b></p>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>																	
<p><b>10:30 – 12:30</b></p>	<p align="center"><b>Parallel Oral Sessions 4</b></p> <table border="1" data-bbox="260 480 1070 600"> <thead> <tr> <th>Lecture Hall 1</th> <th>Lecture Hall 2</th> <th>G Auditorium</th> <th>Classroom G1</th> <th>Classroom G2</th> <th>Classroom C1</th> </tr> </thead> <tbody> <tr> <td><b>MS01</b></td> <td><b>MS06-B</b></td> <td><b>MS09</b></td> <td><b>MS07</b></td> <td><b>MS10</b></td> <td><b>MS08</b></td> </tr> </tbody> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	<b>MS01</b>	<b>MS06-B</b>	<b>MS09</b>	<b>MS07</b>	<b>MS10</b>	<b>MS08</b>
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1													
<b>MS01</b>	<b>MS06-B</b>	<b>MS09</b>	<b>MS07</b>	<b>MS10</b>	<b>MS08</b>													
<p><b>12:30 – 13:40</b></p>	<p align="center"><b>Lunch</b></p>																	
<p><b>13:40 – 13:45</b></p> <p><b>13:45 – 14:15</b></p>	<p align="center">Lecture Hall 1</p> <p align="center"><b>Learn about Tescan</b></p> <p align="center"><b>Invited Lecture:</b></p> <p align="center">Eduardo Cardoso de Abreu</p>	<p align="center">Lecture Hall 2</p> <p align="center"><b>Learn about Thermo Fisher</b></p> <p align="center"><b>Invited Lecture:</b></p> <p align="center">Sujit S. Datta</p>																
<p><b>14:20 – 15:20</b></p>	<p align="center"><b>Parallel Oral Sessions 5</b></p> <table border="1" data-bbox="260 887 1070 1007"> <thead> <tr> <th>Lecture Hall 1</th> <th>Lecture Hall 2</th> <th>G Auditorium</th> <th>Classroom G1</th> <th>Classroom G2</th> <th>Classroom C1</th> </tr> </thead> <tbody> <tr> <td><b>MS02</b></td> <td><b>MS06-A</b></td> <td><b>MS22</b></td> <td><b>MS19</b></td> <td><b>MS10</b></td> <td><b>MS03</b></td> </tr> </tbody> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	<b>MS02</b>	<b>MS06-A</b>	<b>MS22</b>	<b>MS19</b>	<b>MS10</b>	<b>MS03</b>
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1													
<b>MS02</b>	<b>MS06-A</b>	<b>MS22</b>	<b>MS19</b>	<b>MS10</b>	<b>MS03</b>													
<p><b>15:20 – 16:30</b></p>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>																	
<p><b>16:30 – 18:00</b></p>	<p align="center"><b>Parallel Oral Sessions 6</b></p> <table border="1" data-bbox="260 1110 1070 1230"> <thead> <tr> <th>Lecture Hall 1</th> <th>Lecture Hall 2</th> <th>G Auditorium</th> <th>Classroom G1</th> <th>Classroom G2</th> <th>Classroom C1</th> </tr> </thead> <tbody> <tr> <td><b>MS05</b></td> <td><b>MS06-B</b></td> <td><b>MS11</b></td> <td><b>MS13</b></td> <td><b>MS15</b></td> <td><b>MS12</b></td> </tr> </tbody> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	<b>MS05</b>	<b>MS06-B</b>	<b>MS11</b>	<b>MS13</b>	<b>MS15</b>	<b>MS12</b>
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1													
<b>MS05</b>	<b>MS06-B</b>	<b>MS11</b>	<b>MS13</b>	<b>MS15</b>	<b>MS12</b>													
<p><b>18:15 – 21:00</b></p>	<p align="center"><b>Visit to the Louvre Abu Dhabi</b> <i>(more information on page 26)</i></p>																	

# WEDNESDAY, 01 JUNE 2022

<p><b>8:30 – 8:40</b></p> <p><b>8:40 – 9:20</b></p>	<p align="center"><b>Plenary Session: Main Auditorium</b></p> <p align="center"><b>Awards Ceremony</b></p> <p align="center">InterPore Medal for Porous Media Research: <i>Masa Prodanovic</i> InterPore Award for Porous Media Research: <i>Sujit S. Datta</i></p> <p align="center"><b>Plenary Lecture: Peng Xu</b></p>																	
<p><b>9:20 – 10:30</b></p>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>																	
<p><b>10:30 – 12:15</b></p>	<p align="center"><b>Parallel Oral Sessions 7</b></p> <table border="1" data-bbox="250 475 1029 587"> <tr> <td>Lecture Hall 1</td> <td>Lecture Hall 2</td> <td>G Auditorium</td> <td>Classroom G1</td> <td>Classroom G2</td> <td>Classroom C1</td> </tr> <tr> <td><b>MS01</b></td> <td><b>MS06-A</b></td> <td><b>MS22</b></td> <td><b>MS07</b></td> <td><b>MS15</b></td> <td><b>MS03</b></td> </tr> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	<b>MS01</b>	<b>MS06-A</b>	<b>MS22</b>	<b>MS07</b>	<b>MS15</b>	<b>MS03</b>
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1													
<b>MS01</b>	<b>MS06-A</b>	<b>MS22</b>	<b>MS07</b>	<b>MS15</b>	<b>MS03</b>													
<p><b>12:15 – 13:25</b></p>	<p align="center"><b>Lunch</b></p>																	
<p><b>13:25 – 13:30</b></p> <p><b>13:30 – 14:00</b></p>	<p align="center">Lecture Hall 1</p> <p align="center"><b>Learn about MDPI Computation</b></p> <p align="center"><b>Invited Lecture:</b> Dominique Derome</p>			<p align="center">Lecture Hall 2</p> <p align="center"><b>Learn about IFPEN/STET</b></p> <p align="center"><b>Invited Lecture:</b> Zuleima T. Karpyn</p>														
<p><b>14:05 – 14:50</b></p>	<p align="center"><b>Parallel Oral Sessions 8</b></p> <table border="1" data-bbox="250 887 1029 999"> <tr> <td>Lecture Hall 1</td> <td>Lecture Hall 2</td> <td>G Auditorium</td> <td>Classroom G1</td> <td>Classroom C1</td> </tr> <tr> <td><b>MS05</b></td> <td><b>MS06-A</b></td> <td><b>MS09</b></td> <td><b>MS07</b></td> <td><b>MS12</b></td> </tr> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom C1	<b>MS05</b>	<b>MS06-A</b>	<b>MS09</b>	<b>MS07</b>	<b>MS12</b>		
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom C1														
<b>MS05</b>	<b>MS06-A</b>	<b>MS09</b>	<b>MS07</b>	<b>MS12</b>														
<p><b>14:50 – 16:00</b></p>	<p align="center"><b>Poster Session, Exhibition, Coffee Break</b></p>																	
<p><b>16:00 – 17:00</b></p>	<p align="center"><b>Parallel Oral Sessions 9</b></p> <table border="1" data-bbox="250 1102 1029 1240"> <tr> <td>Lecture Hall 1</td> <td>Lecture Hall 2</td> <td>G Auditorium</td> <td>Classroom G1</td> <td>Classroom G2</td> <td>Classroom C1</td> </tr> <tr> <td><b>MS20</b></td> <td><b>MS23</b></td> <td><b>MS09</b></td> <td><b>MS13</b></td> <td><b>MS04</b></td> <td><b>SAC Career Event</b></td> </tr> </table>						Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1	<b>MS20</b>	<b>MS23</b>	<b>MS09</b>	<b>MS13</b>	<b>MS04</b>	<b>SAC Career Event</b>
Lecture Hall 1	Lecture Hall 2	G Auditorium	Classroom G1	Classroom G2	Classroom C1													
<b>MS20</b>	<b>MS23</b>	<b>MS09</b>	<b>MS13</b>	<b>MS04</b>	<b>SAC Career Event</b>													
<p><b>17:15 – 22:00</b></p>	<p align="center"><b>Gala Evening</b> (<i>more information on page 112</i>)</p>																	

# THURSDAY, 02 JUNE 2022

<p><b>8:30 – 8:35</b></p> <p><b>8:35 – 9:05</b></p>	<p>Lecture Hall 1</p> <p><b>Learn about HOT</b></p> <p><b>Invited Lecture:</b> Evangelos Tsotsas</p>			<p>Lecture Hall 2</p> <p><b>Company Pitch</b></p> <p><b>Invited Lecture:</b> Ruina Xu</p>		
<p><b>9:10 – 10:10</b></p>	<p><b>Parallel Oral Sessions 10</b></p>					
<p><b>10:10– 11:20</b></p>	<p><b>Poster Session, Exhibition, Coffee Break</b></p>					
<p><b>11:20 – 12:20</b></p>	<p><b>Parallel Oral Sessions 11</b></p>					
<p><b>12:20 – 13:30</b></p>	<p><b>Lunch</b></p>					
<p><b>13:30 – 15:15</b></p>	<p><b>Parallel Oral Sessions 12</b></p>					
<p><b>15:15 – 16:25</b></p>	<p><b>Poster Session, Exhibition, Coffee Break</b></p>					
<p><b>16:25 – 16:40</b></p> <p><b>16:40 – 17:20</b></p> <p><b>17:20 – 17:30</b></p>	<p><b>Plenary Session: Main Auditorium</b></p> <p><b>Awards Ceremony</b></p> <p>InterPore – PoreLab Award for Young Researchers: <i>Senyou An</i> Rien van Genuchten Early-Career Award of Porous Media for a Green World: <i>Siva Rama Satyam Bandaru</i> InterPore National Chapter Award: <i>France National Chapter</i></p> <p><b>Plenary Lecture:</b> Abraham D. Stroock</p> <p><b>Closing Ceremony</b></p> <p>MDPI Energies Student Poster Awards InterPore Rosettes</p>					

# PROGRAM HIGHLIGHTS

## Welcome Reception

Sunday, Khalifa University Innovation Center 18:30 - 21:00

## Opening Ceremony

Monday, Main Auditorium 8:30 - 8:50

## Award Ceremony: *InterPore Meritorious Service Medal*

Monday, Main Auditorium 8:50 - 9:00

## Plenary Lecture: *Adam Weber*

Monday, Main Auditorium 9:00 - 9:40

## COMSOL & ZEISS Presentations

Monday, Lecture Hall 1 & 2 13:30 - 13:35

## Invited Lectures: *Vahid Niasar & Stephan Matthai*

Monday, Lecture Hall 1 & 2 13:35 - 14:05

## Lab Tours

Monday 18:10 - 20:10

## Award Ceremony: *InterPore Honorary Lifetime Membership Award & Kimberly-Clark Distinguished Lectureship Award*

Tuesday, Main Auditorium 8:30 - 8:40

## Plenary Lecture: *Laura De Lorenzis*

Tuesday, Main Auditorium 8:40 - 9:20

## Tescan & Thermo Fisher Presentations

Tuesday, Lecture Hall 1 & 2 13:40 - 13:45

## Invited Lectures: *Eduardo Cardoso de Abreu & Sujit S. Datta*

Tuesday, Lecture Hall 1 & 2 13:45 - 14:15

## Visit to the Louvre Abu Dhabi

Tuesday, 18:15 - 21:00



# PROGRAM HIGHLIGHTS

Award Ceremony: *InterPore Medal for Porous Media Research & InterPore Award for Porous Media Research*

Wednesday, Main Auditorium 8:30 - 8:40

Plenary Lecture: *Peng Xu*

Wednesday, Main Auditorium 8:40 - 9:20

MDPI Computations & IFPEN/STET Presentations

Wednesday, Lecture Hall 1 & 2 13:25 - 13:30

Invited Lectures: *Dominique Derome & Zuleima T. Karpyn*

Wednesday, Lecture Hall 1 & 2 13:30 - 14:00

SAC Career Event

Wednesday, Classroom C1 16:00 - 17:00

Sheikh Zayed Grand Mosque Tour & Gala Dinner

Wednesday, 17:15 - 22:00

HOT Presentation

Thursday, Lecture Hall 1 8:30 - 8:35

Invited Lectures: *Evangelos Tsotsas & Ruina Xu*

Thursday, Lecture Hall 1 & 2 8:35 - 9:05

Award Ceremony: *InterPore PoreLab Award for Young Researchers, Porous Media for a Green World Award & National Chapter Award*

Thursday, Main Auditorium 16:25 - 16:40

Keynote Lecture: *Abraham D. Stroock*

Thursday, Main Auditorium 16:40 - 17:20

Closing Ceremony: *MDPI Energies Student Poster Awards & InterPore Rosettes*

Thursday, Main Auditorium 17:20 - 17:30

# LOUVRE ABU DHABI

*Tuesday, 18:15*

All in-person participants and accompanying guests will receive **complimentary tickets** to the Louvre Abu Dhabi, made possible by a **generous donation from the Abu Dhabi Ministry of Culture and Tourism**.

Buses to the Louvre Abu Dhabi will depart Khalifa University at approximately 17:15, directly after Parallel Session 6.

The iconic Louvre Abu Dhabi is the first universal museum in the Arab World, translating and fostering the spirit of openness between cultures. As one of the premier cultural institutions located in the heart of the Saadiyat Cultural District on Saadiyat Island, this art-lovers' dream displays works of historical, cultural and sociological significance, from ancient times to the contemporary era.



مكتب  
المؤتمرات  
والمعارض  
CONVENTION  
& EXHIBITION  
BUREAU

## Software

# Characterization of porous media

## Avizo Software

Porous media are strongly characterized by their internal microstructure, which needs to be accurately described in order to determine performance and macroscopic properties.

Thermo Scientific™ Avizo™ Software provides an advanced digital environment to analyze imaging data from any microscopes, CTs and micro-CTs. Researchers can visualize, quantify, and understand complex material structures and properties.

Avizo Software helps materials scientists design clean, safe, high-performance materials. It provides powerful analytical capabilities to better understand the characteristics of natural materials, such as rocks and soils, for more responsible natural resources exploitation and environmental applications.

Learn more at [thermofisher.com/avizo](https://thermofisher.com/avizo)  
or visit booth #01 at InterPore 2022

Through collaborative teams that push boundaries and endless opportunities to work with some of the world's most recognized brands, at Kimberly-Clark you and your purpose are in the driver seat of your career.

**Huggies®. Kleenex®. Andrex®. Scott®. Kotex®. Depend®.**

For 150 years, our brands have been brought to market by a team of purpose-led innovators dedicated to creating Better Care for a Better World. And it takes the right people—in the right jobs and the right place—to make that happen. Join our 46,000+ employees who are changing the world for the better and generously giving back to communities and causes around the globe.

 **Kimberly-Clark**

## Welcome Reception

Innovation Center 18:30 - 21:00

Join us for a welcome reception, sponsored by our hosts, Khalifa University. Drinks, dinner, and official greetings from Khalifa dignitaries will be provided. InterPore awards will also be presented to recipients of 2020 and 2021 awards, who are present in Abu Dhabi, as well as to new recipients of InterPore Rosette. This is a great opportunity to socialize with your peers, rub elbows with the VIP, and kick-off the conference.

Tickets are included in the onsite registration and accompanying persons fees. The opening and awards ceremonies will be broadcast through the live stream on Whova for viewing by our online participants.

## Welcoming Speeches

18:30 - 18:40

- Dr. Arif Sultan Al Hammadi, Khalifa University Executive Vice President and General Chair, InterPore2022
- Prof. Majid Hassanizadeh, InterPore Managing Director
- Dr. Mohamed Sassi, InterPore2022 Local Organizing Committee Chair

## Award Ceremony

18:40 - 18:50

### InterPore Rosettes

InterPore activities are carried out mainly by volunteers. It takes many voluntary working hours to make an international platform like InterPore a success. Recognizing and honoring volunteers sets a standard for service, encourages a sustained commitment to participation, and inspires others to commit themselves as well.

Each year, InterPore honors selected individuals who have made very significant contributions to InterPore activities; they receive the InterPore Rosette.

### Welcome Reception Sponsored By:



جامعة خليفة  
Khalifa University

# MONDAY, 30 MAY 2022

## Plenary Session

Main Auditorium 8:45 - 9:40

**Chair:** Michel Quintard

Opening Ceremony 8:45 - 8:50

Award Ceremony 8:50 - 9:00



### **InterPore Meritorious Service Medal**

Azita Ahmadi-Senichault

*École Nationale Supérieure d'Arts et Métiers, France*

The InterPore Meritorious Service Medal recognizes individuals for exceptional, prolonged, impactful, and meaningful services to the Society. These individuals have exhibited such exceptional devotion of time, effort, thought, and action as to set them apart from other contributions.



©visitabudhabi.ae

## Plenary Lecture 9:00 - 9:40



**Adam Weber**

Lawrence Berkeley National Laboratory

### **Transport and Multiphase Flow in Porous Media for Electrochemical Technologies**

As low-temperature electrochemical technologies become increasingly important in our energy paradigm, there is a need to examine them holistically. For commercialization and optimization, one requires a detailed understanding of the underlying physics and phenomena, which is directly coupled to their structure that is composed of various porous media including porous electrodes and porous backing layers. Furthermore, for such technologies to become practical, they need to operate at high current densities, which drives the need for efficient transport of reactants and removal of products from the reaction site. Finally, such interactions most often involve multiphase flow, whether it is hydrogen fuel cells, water electrolyzers, CO<sub>2</sub> reduction devices, etc. In this talk, we will explore the commonalities and approaches towards understanding multiphase flow in these systems with a focus on the importance that such phenomena play on the overall transport phenomena and cell performance..

## Poster Exhibition: Session 1 Exhibition Area 9:40 - 10:50

### *Nanoporous Media*

[167] **Molecular investigation on sorption-induced kerogen deformation and its impact on gas transport**

*Jian Wu, PENGYU HUANG, Luming Shen*

[204] **Experiment and model of multi-scale dynamic diffusivity and permeability for gas(CH<sub>4</sub>/He) flow in micro-nano pores in series connection of coal**

*zhiqiang Li, Lin Li*

[96] **Molecular Dynamics Study of Carbonated Water Confined in Nano Slit Illite Pore: Effect of the Layer Charge**

*Masashige Shiga*

### *Porous media, environment and biology*

[567] **Pore-scale displacement and trapping mechanisms for underground hydrogen storage**

*Maksim Lysyy, Per-Hilmar Knut van der Hart, Geir Ersland, Martin Ferno*

[294] **Quantifying risks of salt contamination of freshwater aquifers during Aquifer Thermal Energy Storage**

*Geraldine Regnier, Pablo Salinas, Matthew D. Jackson*

[74] **Low-field NMR studies to investigate the effects of salinity in the behaviour of brines within porous media.**

*Aristarchos Mavridis, Carmine D'Agostino*

[387] **Understanding the influence of pore-scale structural heterogeneity in CO<sub>2</sub> geo-sequestration**

*Farshad Daraei Ghadikolaei, Anna Herring, Mark Knackstedt, Mohammad Saadatfar*

[593] **Modeling Microbial Enhanced Oil Recovery (MEOR) Optimization Augmented with Formation Damage Mitigation Within Sandstone Core Under Adverse Subsurface Oil-Field Conditions**

*Susmit Chakraborty, Suresh Kumar Govindarajan, Sathyannarayana N. Gummadi*



Poster Exhibition: Session 1, cont.  
Exhibition Area 9:40 - 10:50

*Multi-scale, multi-physics and non-linear effects in porous media*

[162] **Hydrate growth and electrical properties modeling based on digital rock techniques**

*Haitao Tian, Jianchao Cai, Wei Wei, Yuxuan Xia*

[164] **The degree and law of the influence of microscopic pore structure on permeability in digital rocks**

*Xiaobin Li, Wei Wei, Lei Wang, Jianchao Cai*

[273] **Solute movement in soil columns under different solute concentrations and identification of transport parameters**

*Boris Maryshev, Anna Evgrafova, Mikhail Khabin*

[333] **The First Experimental Design and Application of Large Horizontal Well Spacing Superheated Steam Flooding for Thin Heavy Oil Reservoir in Bohai Bay**

*Guangming Pan, Lei Zhang, Hao Li, Lijie Yang, Like Yuo*

*Big data, uncertainty, machine learning and imaging in porous media*

[127] **Study on laboratory measurement method of anisotropic permeability based on passive differential pressure ratio**

*Xuehao Pei, Yuetian Liu, Tengda Rang*

[137] **Toward integration of NMR and traditional centrifuge capillary pressure curves: A comparison study**

*George Yabesh, Stephen Banks, Ausama Giwelli, Lionel Esteban, Ahmed Al-Yaseri*

[138] **Enhanced Super Resolution Generative Adversarial Network (ESRGAN) for improving the resolution of micro-CT images**

*Mohamed Regaieg*

[318] **Parameter estimation for unsaturated flow with an efficient encoder-decoder convolutional neural network**

*Mohammad Reza Hajizadeh Javaran, Mohammad Mahdi Rajabi, Benjamin Belfort, Marwan Fahs*

# MONDAY, 30 MAY 2022

Poster Exhibition: Session 1, cont.  
Exhibition Area 9:40 - 10:50

*Big data, uncertainty, machine learning and imaging in porous media, cont.*

[403] **Test of multi task XGBoost model and its application in Maokou-1 Member, east Sichuan Basin**

*Keran Li, Yingjie Ma, Yang Lan, Zhaokai Zhang, Jianping Fan, Jinmin Song*

[556] **Pore-scale imaging of asphaltene deposition with permeability reduction and wettability alteration**

*Yihuai Zhang, Qingyang Lin, Ali Qaseminejad Raeini, Yutaka Onaka, Hirok Iwama, Katsumo Takabayashi, Martin Blunt, Branko Bijeljic*

 **TESCAN**



**TESCAN** micro-CT

**Performance simply delivered**

Fast scan speeds, ultimate versatility  
and superior image quality



Monday Detailed Program

## Oral presentations: Parallel sessions 1

### MS18: Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers

Lecture Hall 1

**Chairs:** *Tannaz Pak, Carlo Bianco, Chris Boeije*

---

10:50 [462] **Laboratory scale demonstration of cationic organics removal by graphene oxide nanosheets injection in porous media**  
*Carlo Bianco, Ali Beryani, Alessandro Casasso, Rajandrea Sethi, Tiziana Tosco*

---

11:05 [269] **Evaluation of zero-valent iron nanoparticles (nZVI) injection tests in porous media using synchrotron X-ray computed microtomography**  
*Daphne Silva Pino, Tannaz Pak, Luiz Fernando de Lima Luz Junior, Tiziana Tosco, Reginaldo Bertolo, Nathaly Lopes Archilha*

---

11:20 [481] **Long-term retention and leaching of PFAS in the vadose zone: controlling processes, mathematical formulation, and practical modeling approaches**  
*Bo Guo*

---

11:35 [178] **Transport and retention of nanoparticles in natural porous media-Effect of pore structure and geometry.**  
*Raoul Djou Fopa, Carlo Bianco, Nathaly Lopes Archilha, Tannaz Pak*

---

11:50 [362] **Pore-scale hydrodynamic and biogeochemical controls on manganese biomineralization in granular media**  
*Eleanor Fadely, Gaitan Gehin, Lena Ray, Veronica Morales, Jasquelin Peña*

---

Oral presentations: Parallel sessions 1, cont.

## MS06-A: Physics of multiphase flow in diverse porous media

Lecture Hall 2

**Chairs:** Sharon Ellman, Peyman Mostaghimi

- 
- |       |  |
|-------|--|
| 10:50 | <b>[39] Dynamic Mode Decomposition (DMD) for Analyzing Dynamics in Multiphase Flow in Porous Media</b><br><i>Steffen Berg, James McClure, Ryan Armstrong, Catherine Spurin</i>                                     |
| 11:05 | <b>[78] From Darcy flow to fingering instabilities in a fluid-driven silo</b><br><i>Miles Morgan, David James, Martin Monloubou, Bjornar Sandnes</i>   |
| 11:20 | <b>[84] Temperature Dependency of Steady-State Relative Permeability Curves: Aquistore CO2 Storage Site, Canada</b><br><i>Amir Haghi, Richard Chalaturnyk</i>  |
| 11:35 | <b>[116] Quantitative determination of the threshold pressure for a discontinuous phase to pass through a constriction using microscale simulation</b><br><i>Gloire Imani, Lei Zhang, Martin Blunt, Chao Xu</i>    |
| 11:50 | <b>[150] Investigating the pore scale mechanism of miscible phases mixing in porous medium 2D</b><br><i>Yahel Eliyahu-Yakir, Tal Ballas, Ludmila Abezgauz, yaniv edery</i>   |
| 12:05 | <b>[347] Transition from viscous fingers to compact displacement during unstable drainage in porous media</b><br><i>Marcel Moura, Fredrik Kvalheim Eriksen, Mihailo Jankov, Antoine Turquet, Knut Jorgen Maloy</i> |
-

Oral presentations: Parallel sessions 1, cont.

**MS11: Microfluidics and nanofluidics in porous systems**

G Auditorium

**Chairs:** *Sophie Roman, Hossein Hejazi*

10:50	[14] <b>Experimental study of drying in the presence of fluorescent particles in model porous media</b> <i>Elisa Ghiringhelli, Manuel MARCOUX, Marc Prat</i>
11:05	[28] <b>Pore-Scale Insights into In-Situ Mixing Control By Polymer-Enhanced Low-Salinity Waterflooding (PELS)</b> <i>Hassan Mahani, Mohammadreza Poshtpanah, Behzad Rostami</i>
11:20	[62] <b>Microfluidics-based analysis of dynamic contact angles relevant for underground hydrogen storage</b> <i>Willemijn van Rooijen, Leila Hashemi, Maartje Boon, Rouhi Farajzadeh, Hadi Hajibeygi</i>
11:35	[234] <b>Wettability alteration in thiolene-based polymers: surface characterization and advanced fabrication techniques</b> <i>Bahtab Masouminia, Benzhong Zhao</i>
11:50	[519] <b>Nanoparticle-based suspensions and emulsions for enhanced oil recovery</b> <i>Anastasia Strekla, Christina Ntente, Maria Theodoropoulou, Christos Tsakiroglou</i>
12:05	[579] <b>Measurement of capillary pressure and relativity permeability relations for two-phase air-water cross flow in thin sintered metal wicks</b> <i>Bhaskarjyoti Sarma, Srivathsan Sudhakar, Dominik Tomasz Nasilowski, Justin A. Weibel</i>

Oral presentations: Parallel sessions 1, cont.

## MS21: Non-linear effects in flow and transport through porous media

Classroom G1

**Chairs:** *Mohaddeseh Mousavi Nezhad, Yves Méheust*

---

10:50 [248] **The role of birefringent strands on the stability of viscoelastic flows through porous media**  
*Omar Mokhtari, Jean-Claude Latché, Michel Quintard, Yohan Davit*

---

11:05 [261] **Elastic flow instabilities in 3D porous media**  
*Christopher Browne, Richard Huang, Callie Zheng, Sujit Datta*

---

11:20 [297] **Some analytical results about countercurrent capillary imbibition.**  
*Benoit Noettinger, Benjamin Braconnier, Frederic Douarche, Michel Quintard, Sina Momeni*

---

11:35 [282] **Ganglia mobilization by purely elastic instability**  
*pegah shakeri, Michael Jung, Ralf Seemann*

---

11:50 [348] **Two-phase non-Newtonian flow in porous medium**  
*Federico Lanza, Alex Hansen, laurent talon, Tom Vincent-Dospital, Alberto Rosso*

---

12:05 [371] **The anomalous moisture transport in cementitious materials: causes and models**  
*Zhidong Zhang, Ueli Angst*

---

Oral presentations: Parallel sessions 1, cont.

## MS10: Advances in imaging porous media: techniques, software and case studies

Classroom G2

**Chairs:** *Marijn Boone, Matthijs de Winter*

- 
- 10:50 [243] **Enhancement of in-situ terahertz liquid front tracking technique in porous media using a novel experimental setup and associated analysis tool**  
*Jongmin Lee, Daniel J. Goodwin, Ranjit M. Dhenge, Gabriele Bano, Axel J. Zeitler*
- 
- 11:05 [451] **Dynamic X-ray micro-CT measurements of tablet disintegration**  
*Jan Dewanckele, Wesley De Boever, Shumaiya Ferdoush, Pedro Martins, Marcial Gonzalez*
- 
- 11:20 [461] **Time and spatial resolved X-ray imaging of wicking in interlaced yarns**  
*Robert Fischer, Dominique Derome, Christian Schlepuetz, Rene Rossi, Jan Carmeliet*
- 
- 11:35 [586] **Hysteresis in Multiphase Flow and Application to Hydrogen Storage**  
*Sepideh Goodarzi, Abdulla Alhosani, Martin Blunt, Branko Bijeljic*
- 
- 11:50 [141] **Characterizing Ice Melting Dynamics in Porous Media with NMR-MRI**  
*Natnael Haile, Hongxia Li, Yadong Zhang, Nahla AlAmoodi, TieJun Zhang*
-

Oral presentations: Parallel sessions 1, cont.

## MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

Classroom C1

**Chairs:** Marco Dentz, Mozhdeh Sajjadi

---

10:50	<b>[217] Feedback mechanisms between precipitation and dissolution reactions across randomly heterogeneous conductivity fields</b> <i>yaniv edery, Martin Stolar, Giovanni Porta, Alberto Guadagnini</i>
11:05	<b>[310] Pattern formation in carbonate precipitation in confined geometry</b> <i>Negar Shahsavari, Xiaojing Fu, Benzhong Zhao</i>
11:20	<b>[22] Multiscale characterisation of gas diffusion in coal</b> <i>YU JING, Lkhamsuren Baatar, Meng Yuan, Peyman Mostaghimi</i>
11:35	<b>[344] Autocatalytic reaction-diffusion-advection fronts in radial geometry</b> <i>Alessandro Comolli, Fabian Brau, Anne De Wit</i>
11:50	<b>[512] Inertia and 3D Flow Effects on Mixing and Reaction at Channel Intersections</b> <i>Peter Kang, Sang Lee, Woonghee Lee, Jingxuan Deng, Etienne Bresciani, Marco Dentz</i>
12:05	<b>[542] Laboratory-Scale Investigation of Secondary Sulfate Precipitation in Marcellus and Wolfcamp Shales</b> <i>Asli Gundogar, Adam Jew, John R. Bargar, Anthony Kavscek</i>

---



## Invited Parallel Session

Lecture Hall 1 13:30 - 14:05

**Chair:** Jacques Huyghe

Learn about COMSOL Multiphysics 13:30 - 13:35



**Vahid Niasar** 13:35 - 14:05

*University of Manchester*

### **Advances in pore-scale characterisation of multiphase flow and transport in porous materials**

Understanding fundamentals of flow and transport in porous media has been significantly enhanced using pore-scale characterisation methods, such as pore-scale modelling and imaging. During the last five decades “pore-scale characterisation” has been established as a major field of porous media research, has imposed new questions and highlighted gaps in knowledge that has enhanced our understanding for practical implications.

In this presentation, I present some key pore-scale findings related to solute transport in saturated and unsaturated porous media. The experimental results have been obtained using three different complementary approaches : (a) optical imaging of quasi-3D micromodels, (b) 4D X-ray microCT imaging glass-bead and sand packing, (c) GPU-enhanced pore-network models.

Two main aspects of the results will be discussed in this presentation (i) the non-Fickian behaviour of transport in unsaturated porous media and the critical role of saturation morphology (ii) time scale of transport during loading and unloading of a solute and the potential role of non-linear transport.

## Invited Parallel Session (*cont.*)

Lecture Hall 2 13:30 - 14:05

**Chair:** *Tayfun Babadagli*

Learn about Learn about ZEISS Microscopy Solutions for Pore Characterization 13:30 - 13:35



**Stephan Matthai** 13:35 - 14:05

*University of Melbourne*

### **Modelling & Simulation of Multiphase Flow in Highly Heterogeneous Geologic Porous Media**

Geologic heterogeneity presents itself in the form of nested accumulations of granular porous media, ranging from poorly indurated soils to brittle rocks. The depositional environment determines the association of sediment types, and the environmental processes shape, structure, and juxtapose different deposits. Desert dunes, for example, are hundred-metre-tall stacks of mm-thin sand sheets varying in grain size and composition. This layering is disrupted by slides, slumps, and other discontinuities. It is amplified by chemical interactions with infiltrating fluids, bonding grains together while selectively dissolving and-or precipitating mineral phases.

This presentation explores complex emergent behaviour that arises from the interplay of geoheterogeneity with multiphase flow. Sophisticated digital outcrop models resolving geologic features across multiple length scales are used to constrain digital twins of the real world, offering the unique opportunity to investigate system behaviour in response to engineering interventions and reveal side effects. Of particular interest are the performance analysis and optimisation of multiphase flow systems such as CO<sub>2</sub> geo-sequestration complexes, geothermal reservoirs, and gas storage sites. These simulations can also constrain uncertainty aggravated by the sporadic nature of measurements and the limitations of the geophysical imaging of the subsurface.

The rich behavioural dynamics of geologic porous media saturated with brine and CO<sub>2</sub> will be illustrated with results of hybrid FEM-FVM computations expressing jump discontinuities during simulation.

## Oral presentations: Parallel sessions 2

### MS18: Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers

Lecture Hall 1

**Chairs:** *Tannaz Pak, Carlo Bianco, Chris Boeije*

- 
- |       |   |
|-------|---|
| 14:10 | <b>[441] Regeneration of granular activated carbon by microwave (MW) irradiation and its application in a novel in situ regenerating permeable reactive barrier (PRB) approach (MW-PRB)</b><br><i>Pietro Falciglia, Erica Gagliano, Guido De Guidi, Stefano Romano, Paolo Roccaro, Federico Vagliasindi</i> |
| 14:25 | <b>[440] Transport of Contaminant Slices under Unfavorable Viscosity Ratio in Porous Media with Dead-End Pores</b><br><i>Qingwang Yuan</i>  |
| 14:40 | <b>[444] Fungi-enhanced in-situ bioremediation of NAPL: A microfluidics study</b><br><i>Sang Lee, Marcel Moura, Peter Kang</i>  |
| 14:55 | <b>[350] Estimation of aquifer permeability using aquifer testing with fiber-optic Distributed Strain Sensing</b><br><i>Yi Zhang</i>  |
-

Oral presentations: Parallel sessions 2, cont.

## MS06-B: Interfacial phenomena in multiphase systems

Lecture Hall 2

**Chairs:** *Grigori Chapiro, Eduardo Abreu*

- 
- |       |   |
|-------|---|
| 14:10 | <b>[49] Nanoscale visualization of dissolution and precipitation at calcite-oil-brine interfaces upon aging at variable salinity</b><br><i>Frank Megens, Mohammed B. Alotaibi, Subhash C. Ayirala, Ali A. Yousef, Igor Siretanu, Frieder Mugele</i> |
| 14:25 | <b>[124] Stochastic inverse modeling of transient core-scale three-dimensional two-phase flows</b><br><i>Andrea Manzoni, Alberto Guadagnini, Aronne Dell'Oca, Martina Siena</i>   |
| 14:40 | <b>[412] Measuring fluid-solid interfacial area during multiphase flow in a porous medium at different wetting and flow conditions</b><br><i>Deepshikha Singh, Jyoti Phirani</i>  |
| 14:55 | <b>[155] Modeling of spontaneous imbibition in porous media from modified Lucas-Washburn equation</b><br><i>Jianchao Cai, Chenhao Sun, Yang Liu, Yin Chen</i>   |
-

Oral presentations: Parallel sessions 2, cont.

## MS11: Microfluidics and nanofluidics in porous systems

G Auditorium

**Chairs:** *Hassan Mahani, Florian Doster*

---

14:10 [100] **Geometric criteria for the snap-off of a non-wetting droplet in pore-throat channels with rectangular cross-sections**  
*Chiyu Xie, LUMING CHA, Qihong Feng, Matthew Balhoff*

---

14:25 [250] **Flow-direction dependence of upscaled capillary pressure-saturation curve**  
*Mohammadjavad Shokriafra, Omar Emmanuel Godinez Brizuela, Hamidreza Erfani Gahrooei, Yongqiang Chen, Masoud Babaei, Brian Berkowitz, Vahid Niasar*

---

14:40 [272] **Experimental basis and numerical modeling for a statistical characterization of multimodal spatial heterogeneity of nanoscale calcite dissolution rates**  
*Chiara Recalcati, Martina Siena, Monica Riva, Alberto Guadagnini*

---

14:55 509] **Investigation of the corner flow development in porous media in the absence of main front movement**  
*S.ali ghoreishi, S. H. Hejazi*

---

Oral presentations: Parallel sessions 2, cont.

## MS17: Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

Classroom G1

**Chairs:** Moran Wang, Yingfang Zhou, Mohamed Ezzat

---

[142] **Flower-like Porous Structure for Solar Thermal Distillation and Brine Treatment**

14:10 *Mohamed Abdelsalam, Muhammad Sajjad, Aikifa Raza, Faisal AlMarzooqi, TieJun Zhang*

---

[154] **Experimental measurement of the heat transfer coefficients for gas flow through granular porous media**

14:25 *Shaolin Liu, Azita Ahmadi, Cyril Levet, Jean Lachaud*

---

[176] **A directed network feature for thermal anisotropy of granular materials**

14:40 *Wenbin Fei, Guillermo Narsilio*

---



Photo: Juliana on Unsplash

Oral presentations: Parallel sessions 2, cont.

## MS14: Uncertainty Quantification in Porous Media

Classroom G2

**Chairs:** *Fabricio Sousa, Felipe Pereira, Franciane Rocha*

---

14:10 [27] **Second order deviation of permeability due to unresolved morphological features at the pore scale**

*Sarah Perez, Francisco J. Valdés-Parada, Didier Lasseux, Philippe Poncet*

---

14:25 [468] **Simultaneous Uncertainty Analysis for SCAL Data Interpretation**

*Omidreza Amrollahinasab, Siroos Aziz-Mohammadi, Holger Ott*

---

14:40 [526] **INVERSE AND FORWARD UNCERTAINTY QUANTIFICATION OF RELATIVE PERMEABILITY AND FOAM MODEL PARAMETERS FOR EOR PROCESSES**

*RODRIGO Weber dos SANTOS, Gabriel Brandão de Miranda, Luisa Silva Ribeiro, Bernardo Rocha, Grigori Chapiro*

---

Oral presentations: Parallel sessions 2, cont.

## MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

Classroom C1

**Chairs:** *Mozhdeh Sajjadi, Yu Jing*

---

14:10 [76] **Three-Dimensional Imaging of Density-Driven Convection in Unconsolidated Glass Packings and Consolidated Rock Samples Using X-Ray CT Scanning**

*Anna-Maria Eckel, Ronny Pini*

---

14:25 [133] **Flow heterogeneity impact on dissolution reaction behavior in geologic porous media**

*Zoe Kanavas, Veronica Morales, John Nimmo*

---

14:40 [322] **Gravity shapes permafrost melting after saline water invasion**

*Yumin Wang, Yuheng Zhang, Ke Xu*

---

14:55 [338] **Impact of flow rate on chemical gradients and mixing dynamics in porous media**

*Oshri Borgman, Régis Turuban, Baudouin Géraud, Tanguy Le Borgne, Yves Méheust*

---



[492] **A molecular dynamics study on CO<sub>2</sub> enhanced shale gas recovery in kerogen nanopores**

*Cheng Chen, Jun Xia, Hamid Bahai*

[527] **Wetting/drying mechanisms associated with nanoconfined salt solutions: an optical reflectance study on vapour phase imbibition and adsorption**

*Sujeet Dutta, Hugo Bellezza, Patrick Huber, Olivier Vincent*

[172] **Characterisation and Comparison of Algal Biochar at Different Pyrolysis Temperatures**

*Kamal Elyasi Gomari, David Hughes, Duncan Macquarrie, Suranjana Bose, Tabitha Petchey, Tannaz Pak, Thierry Tonon*

[184] **Optimization of operational parameters for geological hydrogen storage in a saline aquifer - Sothorn North Sea Case Study**

*Saeed Harati, Tannaz Pak, Sina Rezaei-Gomari, Firdovsi Gasanzade*

[251] **3D reactive transport modeling of laboratory-scale CO<sub>2</sub> injection in limestone leading to wormhole formation**

*Atefeh Vafaie, Jordi Cama, Josep M Soler*

[533] **Modeling contrast perfusion and adsorption in the 3D heart**

*RODRIGO Weber dos SANTOS, Evandro Dias Gaio, Bernardo Rocha*

[615] **Capillary sealing efficiency of caprock: Implications for hydrogen and carbon-dioxide geo-storage**

*Amer Alanazi, Muhammad Ali, Hussein Hoteit*

[618] **The SOPHIE initiative – The first interlaboratory comparison of the wet end of the soil water retention curve**

*Benjamin Guillaume, Aurore Degré*

# MONDAY, 30 MAY 2022

Poster Exhibition: Session 2, cont.

Exhibition Area 15:10 - 16:20

*Porous media, environment and biology, cont.*

[623] **Digitizing and Exploring 16 Years of the Registry of Contaminated Sites in the state of São Paulo, Brazil**

*Nouha Samlani, Daphne Silva Pino, Carlo Bianco, Nathaly Lopes Archilha, Tannaz Pak*

*Multi-scale, multi-physics and non-linear effects in porous media*

[102] **A novel microfluidic PEM water electrolyzer cell for the study of counter-current two-phase flow at the anode side**

*Nicole Vorhauer, Supriya Bhaskaran, Evangelos Tsotsas, Tamara Milicic, Vikranth Kumar Surasani*

[388] **Space-time upscaling of reactive transport in porous media**

*Nicolae Suciu, Florin Adrian Radu, Iuliu Sorin Pop*

[571] **Design and Fabrication of 4D Fresnel Lenses for Optical and Thermal Sensing Applications**

*Murad Ali, Haider Butt*

[582] **Adsorption and Transport Behaviors of Shale Oil in Kerogen Slit by Molecular Dynamics Simulation**

*Jie Liu, Shuyu Sun, Yongfei Yang, Jun Yao, Kou Jianlong*

[613] **Experimental Research and Application of Fracture Stress Sensitivity**

*Junjie Liu, jian xiong, jingpeng wang, xiangjun liu*

*Big data, uncertainty, machine learning and imaging in porous media*

[381] **On the CO<sub>2</sub>/caprock interaction based on quantitative image analysis from in-situ x-ray tomography**

*Eleni Stavropoulou, Lyesse Laloui*

[434] **Use of semi-automatic deep learning algorithms for the segmentation and classification of cavities in carbonate fault rocks**

*Eva Wellmann, Joyce Schmatz, Mingze Jiang, Jop Klaver, Anastasia Hoffmann*

[472] **Digital Rock Physics as a Tool for Upscaling Cores Petrophysical Properties from Pore to Continuum Scale**

*Mohamed Mahrous, Enzo Curti, Sergey Churakov, Nikolaos Prasianakis*

Poster Exhibition: Session 2, cont.  
Exhibition Area 15:10 - 16:20


*Big data, uncertainty, machine learning and imaging in porous media, cont.*

[480] **Groundwater contamination in the north-east of the UK: Exploring and projecting pollution trends using the Environment Agency data archives**


*Nouha Samlani, Akanji Lateef, Zia Ush Shamszaman, Tannaz Pak*

[611] **Novel techniques in X-ray nanotomography, scanning electron microscopy and cryogenic focused ion beam microscopy Linking structure and catalytic properties of heterogeneous and automotive catalysts in three dimensions**

*Andy Holwell, Maadhav Kothari, Markus Boese*



**MICROSTRUCTURE AND PORES GMBH**  
SEEING IS BELIEVING




We offer highly accurate multi-scale microstructural investigations of challenging geological, chemical and biological samples down to nanometer resolution. Our analyses integrate cutting-edge preparation methodologies for porosity, 3D-pore connectivity, pore-fluid and micro-structural assessment.

**TECHNOLOGIES AND APPLICATIONS**

- BIB-SEM:** One of our core technologies enables imaging of damage free cross-sections at nano-scale resolution.
- Cryo-BIB-SEM** Enables us to analyze cryo-preserved fluids inside pore networks as well as soft and beam-sensitive matters.
- LMI-BIB-SEM:** Fills the pore network down few nm pore throat diameter to visualize connected pore space.
- VIP:** Automated petrographic analyses to segment fracture networks, minerals, pores and mineral overgrowths.
- MAPRO IMAGE ANALYSIS SOFTWARE:** Deep Learning based pore segmentation and classification of features and minerals of interest.

+49 241 99030094  
info@m-a-p.expert  
Junkerstraße 93  
52064 Aachen  
Germany

<https://www.m-a-p.expert>



© Copyright MAP. All Rights Reserved

## Oral presentations: Parallel sessions 3

### MS02: Porous Media for a Green World: Water & Agriculture

Lecture Hall 1

**Chairs:** Amirhossein Hassani, Li Chen, Sai Rama Krishna Yerramilli

- 
- 16:20 [228] **Dynamic changes in gas concentration in the sap of plants reiterate the enigma of plant water transport under negative pressure**  
*Luciano Pereira, Steven Jansen, Marcela Trevenzoli Miranda, Vinicius Sacramento Pacheco, Lucian Kaack, Gabriel Silva Pires, Xinyi Guan, Eduardo Caruso Machado, H. Jochen Schenk, Rafael Vasconcelos Ribeiro*
- 
- 16:35 [87] **Effects of charring temperature on physicochemical properties of wheat straw biochar**  
*Mardin Abdalqadir, Tannaz Pak, Sina Rezaei-Gomari*
- 
- 16:50 [549] **Effects of Fluid Saturation on Unsaturated Soil Hydraulic and Solute Transport Parameters**  
*Luwen Zhuang, Martinus van Genuchten*
- 
- 17:05 [221] **Explicit spatial modeling at the pore scale unravels the interplay of soil organic carbon storage and structure dynamics**  
*Nadja Ray, Simon Zech, Steffen Schweizer, Franziska Bucka, Ingrid Kögel-Knabner, Alexander Prechtel*
- 
- 17:20 [438] **Hydro-mechanical coupling to uncover stability and permeability of coated biopore on the pore-scale: the way to improve larger-scale modelling**  
*Luis Alfredo Pires Barbosa, Kirill Gerke, Horst Gerke*
- 
- 17:35 [380] **Imbibition dynamics in cellular, xylem-like nanoporous media**  
*Olivier Vincent, Théo Tassin, Erik Huber, Abraham Stroock*
- 
- 17:50 [247] **Modeling evaporation from leaves**  
*Sina Ackermann, Rainer Helmig*
-

Oral presentations: Parallel sessions 3, cont.

**MS06-B: Interfacial phenomena in multiphase systems**

Lecture Hall 2

**Chairs:** *Grigori Chapiro, Eduardo Abreu*

---

16:20 [173] **The effect of surface tension and contact angle dynamics in averaged models for two-phase flow at the pore scale**  
*Stephan B. Lunowa, Arjen Mascini, Carina Bringedal, Tom Bultreys, Veerle Cnudde, Iuliu Sorin Pop*

---

16:35 [326] **Marangoni Effect Maintains Fast Evaporation in Near-Fracture Porous Media**  
*Yandong Zhang, Ke Xu, Fei Yu*

---

16:50 [46] **How simplifying capillary effects can affect the traveling wave solution profiles of the foam flow in porous media**  
*Luis Fernando Lozano, Jhuan Cedro, Rosmery Quispe Zavala, Grigori Chapiro*

---

17:05 [202] **Assessing uncertainties and identifiability of foam displacement models employing different objective functions for parameter estimation**  
*Bernardo Rocha, Andres Valdez, Grigori Chapiro, RODRIGO Weber dos SANTOS*

---

17:20 [270] **Foam Formation and Flow Diversion in Surfactant-Alternating-Gas Injection in Porous Media Micromodels**  
*Nicolle Lima, Marcio Carvalho*

---

17:35 [391] **Intrinsic Mobility control by Foam-like Emulsion?**  
*Ahmad Kharrat, Bianca Brandstätter, Holger Ott*

---

17:50 [393] **Capillary Wave Tweezers**  
*Prashant Agrawal, Bethany Orme, Richard Fu, Matthew Unthank, Hamdi Torun*

---

Oral presentations: Parallel sessions 3, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** *Mohammad Masoudi, Yashar Mehmani, Ke Xu*

- 
- 16:20 [275] **Using In-situ Wettability Measurements to Reconstruct the Wetting Conditions of a Natural Rock**  
*Ruichang Guo, Cheng Chen, Dustin Crandall, Laura Dalton, James McClure, Hongsheng Wang*
- 
- 16:35 [406] **FEATURES OF THE PORE SCALE REACTIVE FLOW WITH COMPLEX CATALYTIC REACTIONS**  
*Pavel Toktaliev, Oleg Iliev*
- 
- 16:50 [246] **Efficient permeability prediction of real digital rock based on Darcy's law**  
*Qinzhuo Liao, Jun Li, Gang Lei, Weiqing Chen, Xu Liu, Shirish Patil*
- 
- 17:05 [197] **Extraction of three-dimensional pore network and corner network with pores of high aspect ratios**  
*Ninghua Zhan, Rui Wu, Evangelos Tsotsas, Abdolreza Kharaghani*
- 
- 17:20 [68] **Dynamic Pore-Network Modeling of Solvent Vapour Extraction**  
*Merouane Khammar, Wahid Niasar*
- 
- 17:35 [487] **An image-based hybrid pore network-continuum modeling framework for fluid flow and transport in multiscale porous media**  
*Li Zhang, Bo Guo, Chao-Zhong Qin, Yongqiang Xiong*
- 
- 17:50 [429] **Image-based reconstruction of multiscale porous structures and coarsening of microporosity regions**  
*bowen shi, Han Jiang, Li Zhang, Bo Guo, Chao-Zhong Qin*
-

Oral presentations: Parallel sessions 3, cont.

## MS17: Thermal Processes, Thermal Coupling and Thermal Properties of Porous Media: modeling and experiments at different scales

Classroom G1

**Chairs:** Moran Wang, Yingfang Zhou, Wenbin Fei

---

16:20 [31] **On the effects of the lithostatic, hydrostatic pressures, and the temperature on Plasma Pulse Geo Drilling (PPGD)**  
*Mohamed Ezzat, Jascha Börner, Daniel Vogler, Wittig Volker, Martin O. Saar*

---

16:35 [54] **Three-dimensional Rayleigh-Darcy convection at high Rayleigh numbers**  
*Marco De Paoli, Francesco Zonta, Sergio Pirozzoli, Alfredo Soldati*

---

16:50 [307] **Pin-fin shape and orientation effects on heat transfer and fluid flow in gas turbine blade**  
*saida chatti, chekib ghabi, abdallah mhimid, Mohamed Sassi*

---

17:05 [369] **Modeling of Powder Bed Dynamics in Thermochemical Heat Storage**  
*Torben Prill, Marie Gollsch, Henrike Schmies, Marc Linder, Thomas Jahnke*

---

17:20 [513] **Micro-scale Laser-induced Fluorescence Thermometry for Multiphase Flow in Porous Media**  
*Samuel Simmons, Christian Pedrigal, Farzan Kazemifar*

---

17:35 [467] **Acute observations into multifractal characteristics of bituminous coals by Qualitative analytics**  
*Paul Naveen, Debyeet Mondal*

---

Oral presentations: Parallel sessions 3, cont.

## MS14: Uncertainty Quantification in Porous Media

Classroom G2

**Chairs:** *Arunasalam Rahunathan, Felipe Pereira, Franciane Rocha*

- 
- 16:20 [535] **Multiscale mixed domain decomposition methods for the simulation of heterogeneous black-oil flows**  
*Fabricio Sousa, Vitor A. Pires, Rafael Guiraldello, Roberto Ausas, Gustavo Carlos Buscaglia, Felipe Pereira*
- 
- 16:35 [511] **Improving the efficiency of reservoir simulations with the Multiscale Perturbation Method for Two-Phase Flows**  
*Franciane Rocha, Het Mankad, Fabricio Sousa, Felipe Pereira*
- 
- 16:50 [447] **MCMC Convergence Studies for Flow Problems with Multiscale Sampling**  
*Alsadig Ali, Abdullah Al-Mamun, Felipe Pereira, Arunasalam Rahunathan*
- 
- 17:05 [493] **Quantification of Heterogeneity of Spatially Averaged Generalized sub-Gaussian Random Fields**  
*Matthew Harrison, Mohaddeseh Mousavi Nezhad, Thomas Hudson, Alberto Guadagnini, Monica Riva*
- 
- 17:20 [566] **Quantifying the uncertainty associated with reservoir compaction forecasting: Role of the experimental estimation of the hydrostatic yield stress.**  
*Frédéric Amour, Mohammad Reza Hajiabadi, Hamid M. Nick*
- 
- 17:35 [198] **Potential geological sequestration of CO<sub>2</sub> in Kazakhstan**  
*Aibar Kamashev, Yerlan Amanbek*
- 
- 17:50 [570] **Optimal control analysis of leakage risk in geological CO<sub>2</sub> sequestration under uncertainties**  
*Ben Mansour DIA, Mazen Saad, Manal Alotibi*
-



Oral presentations: Parallel sessions 3, cont.

**MS16: Fluid Interactions with Thin Porous Media**

Classroom C1

**Chairs:** *Chao-Zhong Qin, Nicolae Tomozeiu*

---

16:20 [35] **Inkjet printing of surfactant solutions onto thin moving porous media**  
*Gianmarco Venditti, Vignesh Murali, Anton Darhuber*

---

16:35 [147] **Surface-washing of contaminated porous substrates**  
*Francesco Paolo Conto, Merlin Aragon Etzold, Emily Butler, Julien R. Landel, Stuart B. Dalziel*

---

16:50 [268] **Capillary imbibition and swelling of thin paper sheets**  
*ruben nicasy, Henk Huinink, Ulrich Hirn, Carina Waldner, Bart Erich, Olaf Adan*

---

17:05 [378] **Application of Screen Channel Liquid Acquisition Devices for Phase Separation in Microgravity**  
*Prithvi Shukla, Michael Dreyer*

---

17:20 [450] **A Review on Polymer Adsorption in Carbonate and Sandstone Reservoirs**  
*Anoo Sebastian*

---

17:35 [454] **Development of a method to investigate the distribution of components in the cross-section of coated media before and after printing**  
*Amber Louwhoff, Jasper van den Hoek, Jeroen Schell, Chris Smit, Hélder Marques Salvador, Nicolae Tomozeiu*

---

17:50 [538] **A One-Dimensional Numerical model of Carbon Corrosion in Catalyst Layers of Proton Exchange Membrane Fuel Cells**  
*Dong Enci, Zhang Ruiyuan, Li Chen*

---

# LAB TOURS

*Monday 18:10*

Attendees who registered for lab tours (via conference registration) will have the opportunity to visit one of two Khalifa University campuses.

All participants registered for a tour should meet at the registration desk no later than 18:15.

## Sas Al Nakhl Campus

*Tour duration: Approximately 2 hours (including transportation)*

- RESEARCH AND INNOVATION CENTER ON CO<sub>2</sub> AND HYDROGEN (RICH)
  - \* Advanced Materials
  - \* Photocatalytic and Chemical Reaction Lab
  - \* Biochemical Processes Lab
  - \* Combustion and Chemical Processes Lab
- CENTER FOR MEMBRANES AND ADVANCED WATER TECHNOLOGY (CMAT)
  - \* Water Technology Laboratories
- Chemical Engineering Lab (porous materials)
- Drilling Simulator Lab
- Fluid Property Lab
- Core Preparation Lab
- Rock Properties Lab
- Drilling Fluids Lab
- Rock Mechanics Lab
- Production Facilities Lab



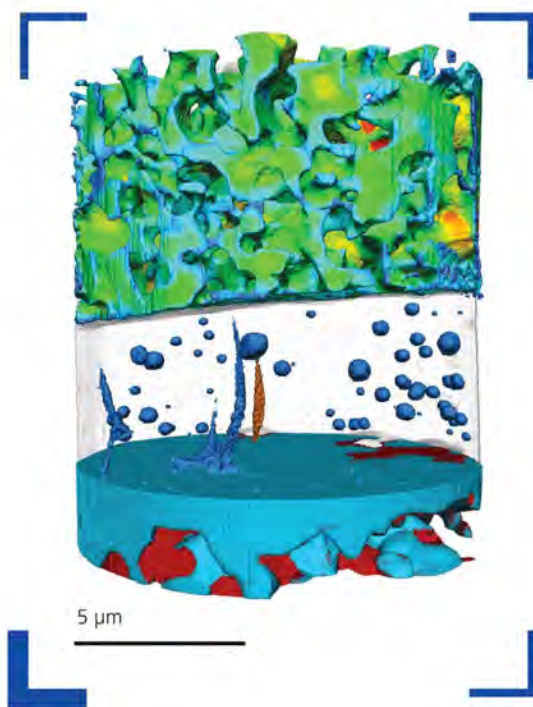
## Main Campus

*Tour duration: Approximately 1 hour*

- ADVANCED DIGITAL AND ADDITIVE MANUFACTURING CENTER (ADAM)
  - \* KU ADAM (Khalifa University Advanced Digital & Additive Manufacturing) Center
- Nano and Water Laboratory
- KU SPACE TECHNOLOGY AND INNOVATION CENTER
  - \* Yahsat Space Lab (YSL)
- Interfacial Energy Transport Lab

# Investigate Your Microstructure to Understand Your Macrostructure

Grains  
Interfaces  
**Pores**  
Particles



## Our Innovations Help to Change the World

Macrostructure to Nanostructure. 2D to 4D.

Solutions in light, X-ray, electron and ion beam microscopy.



[www.zeiss.com/pore-characterization](http://www.zeiss.com/pore-characterization)



Seeing beyond

Software

# Fast and repeatable imaging-based digital rock analysis

## PerGeos Software

Trusted by Oil & Gas peers, Thermo Scientific™ PerGeos Software is a unique solution for Digital Rock Analysis, from whole-core CT to SEM imaging data.

Its visualization, processing, and analysis capabilities for 2D/3D digital rock imagery enable improved evaluation of reservoir quality and faster understanding of static and dynamic rock properties that impact production.

Providing powerful tools and built-in workflows to obtain key geological and petrophysical information from core and rock samples.

PerGeos Software helps geoscientists and petrophysicists rapidly interpret digital rock imagery for E&P engineers to quickly and easily obtain meaningful, actionable data.

Learn more at [thermofisher.com/pergeos](https://thermofisher.com/pergeos)  
or visit booth #01 at InterPore 2022

thermo scientific

## Plenary Session

Main Auditorium 8:30 - 9:20

**Chair:** *Karsten Thompson*

## Award Ceremony 8:30 - 8:40

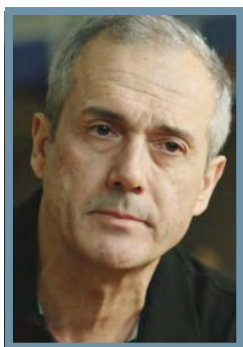


### **InterPore Honorary Lifetime Membership Award**

Signe Kjelstrup

*Norwegian University of Science and Technology,  
Norway*

The Honorary Lifetime Membership Award is reserved for individuals who have made extraordinary contributions to porous media science and technology, who are world renowned in the porous media community, and whose contributions are consistent with the aims and ideals of InterPore.



### **Kimberly-Clark Distinguished Lectureship Award**

Adrian Bejan

*Duke University, USA*

Each year, InterPore selects a porous media researcher with an esteemed international recognition and excellent presentation skills, who works on a broad range of porous media topics, as the "InterPore Kimberly-Clark Distinguished Lecturer on Porous Media Science & Technology". The awardee will share a topic relevant to the industrial porous media community through a series of lectures at various member and non-member organizations.

**Secure your chance to host Prof. Bejan at your institute:** Visit the InterPore virtual booth for more information on how to apply.

**A word of gratitude:** This award has been made possible by a generous grant from Kimberly-Clark, home to some of the world's most iconic and trusted brands, including: Huggies, Scott, Kleenex, Cottonelle and Kotex. For more than a century Kimberly-Clark has been transforming insights and technologies into innovative products and services that improve the lives of nearly a quarter of the world's population.

# TUESDAY, 31 MAY 2022

## Plenary Session, cont.

Main Auditorium 8:30 - 9:20

**Chair:** *Karsten Thompson*

## Plenary Lecture 8:40 - 9:20



Laura De Lorenzis

ETH Zürich

### **Phase-field modeling and simulation of desiccation-induced cracking**

We developed a phase-field approach to model desiccation-induced fracture in porous media. The model describes the coupling of deformation, fluid flow and fracture in partially saturated materials. Different coupling options are discussed and compared, and physically motivated improvements with respect to previous models are introduced. The discretization setting hinges upon a stabilized low-order finite element to maximize efficiency within a three-dimensional implementation. We also discuss the comparison of numerical results to predictions of semi-analytical approaches and to experimental results.

Poster Exhibition: Session 3  
Exhibition Area 9:20 - 10:30

*Multiphase flow in porous media*

[20] **Characterization of water transport in building porous materials based on an analytical spontaneous imbibition model**

*Mingliang Qu, Shengyue Lu, Qingyang Lin, Sajjad Foroughi, Zitao Yu, Martin Blunt*

[136] **Pore-scale two-phase flow simulation of volcanic gas reservoir based on Volume of Fluid method**

*Yongfei Yang, Quan Xu, Xinze Li*

[157] **Pore structure characterization and seepage law analysis of tight reservoir**

*Liang Jiao, Jianchao Cai, Yuxuan Xia, Xiangjie Qin, Kai Xu, Henglei Zhang*

[190] **Pore-Scale Modelling of Hydrogen Transport in Porous Media**

*Shaobin Cai, Yongfei Yang, Quan Xie*

*Interactions between flow and mechanics in porous media*

[38] **Foam plugging performance and flow characteristics in fracture system**

*Zhengxiao Xu, Zhaomin Li, Binfei Li, Qifeng Zhang, Lei Zheng, Yongjin Song, Tong Yu*

[90] **Digital Rock Techniques to Study Physical Properties of Hydrate-Bearing Sediments: Considering Hydrate Distribution Patterns**

*Yuqi Wu, Keyu Liu, Senyou An, Chengyan Lin*

[156] **Wave-induced fluid flow in fractal porous media**

*shanshan Jiang, Jianchao Cai, Wei Wei, Henglei Zhang*

[179] **Performance evaluation on temporary plugging of magnetic responsive hydrogel in hydraulic fracturing of hydrocarbon reservoirs**

*Mingliang Luo, Xiaodong Si, Yige Huang*

Poster Exhibition: Session 3, cont.  
Exhibition Area 9:20 - 10:30

*Interactions between flow and mechanics in porous media, cont.*

[332] **Study on quantitative identification method for lithology of pyroclastic rock**

*Gang Hu, Zhiqiang Mao, peiqiang zhao*

[608] **Simulation of turbulent mixing in channels with reactive boundary conditions**

*Alisdair Soppitt, Mohaddeseh Mousavi Nezhad, Alberto Guadagnini, Thomas Hudson*

*Big data, uncertainty, machine learning and imaging in porous media*

[97] **A multi-dimensional parametric study of variability in multi-phase flow dynamics during geologic CO<sub>2</sub> sequestration accelerated with machine learning**

*Hao Wu, Nicholas Lubbers, Hari Viswanathan, Ryan Pollyea*

[366] **Physics Informed Neural Networks for Fluid Flow in Porous Media**

*Waleed Diab, Mohammed Saad Al Kobaisi*

[395] **Direct comparing the permeability derivation from Images: Empirical Modeling vs Physics-Based Simulation vs Deep Learning**

*Lingyun Kong*

[396] **An optimization-based method for upscaling carbonate volumetric image data**

*Anup Shahi, Anil Kumar, Hemant Singh Kumar, Ranjith Pathegama Gamage*

[410] **Predicting Permeability of Porous Materials on 3D  $\mu$ -CT Images via Machine Learning**

*Mohammad Bakhtiary, Jafar Qajar*



Oral presentations: Parallel sessions 4

**MS01: Porous Media for a Green World: Energy & Climate**

Lecture Hall 1

**Chairs:** *William Rossen, Maartje Boon*

10:30	[312] <b>CO<sub>2</sub> dissolution patterns with precipitation reaction under different permeability</b> <i>Shuai Zheng, Ke Xu, Dongxiao Zhang</i>
10:45	[329] <b>Understanding CO<sub>2</sub> transport and carbonate formation in portland cement-based materials using X-ray micro-CT</b> <i>Laura Dalton, Dustin Crandall, Karl Jarvis, Mohammad Pour-Ghaz</i>
11:00	[557] <b>A Novel Technique to Investigate Effects of Thermal Shocks on Cement for CCS Well Integrity</b> <i>Kai Li, Anne Pluymakers</i>
11:15	[478] <b>Coupled Geochemical-geomechanical Processes in CO<sub>2</sub> Storage Reservoirs</b> <i>Zhuofan Shi, Lauren Beckingham, Jack Montgomery, Charlotte Garing</i>
11:30	[476] <b>Supercritical Adsorption of CO<sub>2</sub> and CH<sub>4</sub> on Shales and Surrogate Porous Media</b> <i>Humera Ansari, JP Martin Trusler, Geoffrey Maitland, Ronny Pini</i>
11:45	[238] <b>Understanding induced seismicity for a safe use of porous media to reach carbon neutrality: the case of the Underground Gas Storage of Castor, Spain</b> <i>Victor Vilarrasa, Silvia De Simone, Jesus Carrera, Antonio Villaseñor</i>
12:00	[289] <b>CO<sub>2</sub> degassing kinetics in porous media</b> <i>Chris Boeije, Cas Verweij, Pacelli Zitha, Anne Pluymakers</i>

Oral presentations: Parallel sessions 4, cont.

## MS06-B: Interfacial phenomena in multiphase systems

Lecture Hall 2

**Chairs:** Bjornar Sandnes, Jamal Alaamri

- 
- 10:30 [420] **Evolution of partially miscible ganglia in porous media: A pore-network approach**  
*Yashar Mehmani, Ke Xu*
- 
- 10:45 [187] **Study on Flow Mechanism and oil Displacement Mechanism of Microcapsule Polymer in Porous Media**  
*Yongsheng Liu, Bei Wei, Jian Hou*
- 
- 11:00 [233] **Comprehensive Study of Fluid-Fluid Displacement in Mixed-Wet Porous Media**  
*Ashkan Irannezhad, Bauyrzhan Primkulov, Ruben Juanes, Benzong Zhao*
- 
- 11:15 [267] **Coupling porous medium-free flow: Formation and evaporation of multiple droplets at the interface**  
*Maziar Veyskarami, Rainer Helmig, Cynthia Michalkowski, Carina Bringedal*
- 
- 11:30 [286] **Unstable invasion during imbibition in regular porous media**  
*Zhongzheng Wang, Jean-Michel Pereira, Emilie Sauret, Yixiang Gan*
- 
- 11:45 [545] **Factors influencing shale wettability from nano to macro-scale**  
*Ahmed Reda Fathy, Muhammad Arif, Stefan Iglauer*
- 
- 12:00 [515] **Characterisation of hydrocarbon bio-degradation in porous media**  
*Edith Larue, Yohan Davit, Michel Quintard, Manuel MARCOUX*
- 
- 12:15 [525] **A quadrature-based scheme for numerical solutions to linearized unsaturated flow equation**  
*Marco Berardi, Fabio Difonzo*
-

## Oral presentations: Parallel sessions 4, cont.

**MS09: Pore-scale modelling**

G Auditorium

**Chairs:** *Ke Xu, Yongfei Yang, Stéphane Zaleski, Mohammad Masoudi*

10:30	[218] <b>Pore scale modelling of stress-dependent permeability and tortuosity of hydrate bearing sediment based on high resolution synchrotron x-ray computed tomography imaging</b> <i>Li Rui, <u>Yingfang Zhou</u>, Wenbo Zhan, Jianhui Yang</i>
10:45	[524] <b>Lagrangian modeling and upscaling of pore-scale transport in random media</b> <i>Giovanni Porta, Matteo Radice, Gael Guedon</i>
11:00	[314] <b>Pore-scale modeling of the dynamics of interface-coupled dissolution-precipitation</b> <i>Deng Hang, Jenna Poonosamy, Sergi Molins</i>
11:15	[115] <b>Pore-scale modelling of non-isothermal reactive transport based on the micro-continuum approach: application to coke combustion in a matrix-fracture system</b> <i>Qianghui Xu, Junyu Yang, Zhiying Liu, Lin Shi</i>
11:30	[117] <b>Lattice Boltzmann modeling of the interfacial mass transport and heterogeneous chemical reaction in the multiphase system: numerical models and applications</b> <i>Junyu Yang, Qianghui Xu, Zhiying Liu, Lin Shi</i>
11:45	[453] <b>Memory, energy dissipation and hysteresis of two-phase flows</b> <i>Ran Holtzman, Marco Dentz, Ramon Planet, Jordi Ortin</i>
12:00	[241] <b>Modelling liquid transport in PEM fuel cells: The effects of compressive stress</b> <i>Yanyao Bao, Yixiang Gan</i>
12:15	[495] <b>Parametric study of coolant-injection flow through different pore geometrical patterns for injection flow control in hypersonic flow</b> <i>Adriano Cerminara, David Adebayo, Ahmad Baroutaji, Arun Arjunan</i>

Oral presentations: Parallel sessions 4, cont.

## MS07: Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Classroom G1

**Chairs:** *Carina Bringedal, Shuyu Sun*

- |       |   |
|-------|---|
| 10:30 | [73] <b>Simulation of reactive transport in heterogeneous porous media with a Newton-Krylov method</b><br><i>Laila Amir, <u>Michel Kern</u></i>   |
| 10:45 | [148] <b>An enhanced branch and bound algorithm for phase stability testing of multicomponent mixtures</b><br><i>Martin Jex, Jiří Mikyška</i>   |
| 11:00 | [153] <b>Modeling of Multicomponent Flow in Porous Media using Higher-Order Methods</b><br><i>Petr Gális, Jiří Mikyška</i>  |
| 11:15 | [529] <b>A numerical approach to incorporating shear thinning effects of polymer in polymer flooding.</b><br><i>Prabir Daripa</i>   |
| 11:30 | [230] <b>Development and experimental validation of lattice Boltzmann method-based simulator for vapor transport in air over a moist soil layer</b><br><i>Jakub Klinkovský, Radek Fučík, Andrew Trautz, Tissa Illangasekare</i> |
| 11:45 | [445] <b>Phase-wise Conservative and Physics Preserving Algorithms for Porous Media Flow</b><br><i>Shuyu Sun</i>  |
| 12:00 | [484] <b>Thermodynamics-Informed Neural Network for Phase Equilibrium in Subsurface Reservoirs</b><br><i>tao zhang, Shuyu Sun</i>   |
| 12:15 | [562] <b>Tightly Coupled Hyperbolic Treatment of Buoyant Two-Phase Flow and Transport in Porous Media</b><br><i>Patrick Jenny, Rasim Hasanzade, Hamdi Tchelepı</i>  |

Oral presentations: Parallel sessions 4, cont.

**MS10: Advances in imaging porous media: techniques, software and case studies**

Classroom G2

**Chairs:** *Gwenole Tallec, Liwei Zhang*

10:30	[336] <b>Pore-scale imaging with measurement of relative permeability and capillary pressure in an altered-wettability limestone with bimodal porosity</b> <i>Guanglei Zhang, Ali Qaseminejad Raeini, Martin Blunt, Branko Bijeljic</i>
10:45	[424] <b>NEW INSIGHTS IN POROUS MEDIA CHARACTERIZATION: SPECTRAL COMPUTED TOMOGRAPHY</b> <i>Wesley De Boever, Marijn Boone, Denis Van Loo, Marek Dosbaba</i>
11:00	[160] <b>Multiscale pore structure evolution of shale induced by dilute acid</b> <i>Sai Xu, Jianchao Cai, Lei Wang, Qi Zhang</i>
11:15	[77] <b>3D X-ray velocimetry for pore-scale flows in geological and industrial porous media</b> <i>Tom Bultreys, Stefanie Van Offenwert, Wannas Goethals, Jan Aelterman, Matthieu Boone, Veerle Cnudde</i>
11:30	[165] <b>Microstructural and mineral phase changes of reinforced concrete caused by high concentration CO<sub>2</sub></b> <i>Quan Xue, Liwei Zhang, KAIYUAN MEI, Yan WANG, Pania Newell, Manguang Gan, Xiaojuan Fu, Xiaochun Li</i>
11:45	[209] <b>Imaging fluid transfers in pores and pore changes through dynamic NMR relaxometry</b> <i>Benjamin Maillet, Rahima Sidi-Boulenouar, Philippe Coussot</i>
12:00	[504] <b>Multi-scale Confocal Imaging Approach Applied to Study the Complex Pore Systems in Middle-Eastern Carbonates</b> <i>Ahmed Hassan, Viswasanthi Chandra, TADEUSZ PATZEK</i>
12:15	[119] <b>Three-dimensional imaging of pore-fracture propagation in Triassic tight sandstones of the Ordos Basin, Northern China</b> <i>Songtao Wu, Zhichao Yu, Xiaohua Jiang, Ling Su, Hua Tian, Fengrong Liao, Cong Yu</i>

# TUESDAY, 31 MAY 2022

Oral presentations: Parallel sessions 4, cont.

## MS08: Mixing, dispersion and reaction processes across scales in heterogeneous and fractured media

Classroom C1

**Chairs:** *Mozhdeh Sajjadi, Anna-Maria Eckel*

[18] **Dispersion and Retention of Colloids in Saturated Sandstone from the Microscale to the Macroscale**

10:30 *Dian Fan, Emily Chapman, Ronny Pini, Alberto Striolo*

[123] **Open-FOAM simulation and analysis of non-Fickian transport in truncated pluri-Gaussian permeability fields.**

10:45 *Eugenio Pescimoro, Matteo Icardi, Marco Bianchi*

[188] **Evidence of anomalous transport controls on long-term variability in stream water chemistry**

11:00 *Marco Dentz, Erwin Zehe, James Kirchner, Brian Berkowitz*

[208] **Pollutant dispersion in heterogeneous porous media: On the impact of the heterogeneity of the exchange rate and permeability field in Mobile-Immobile transport simulations**

11:15 *laurent talon, emma ollivier-triquet, Marco Dentz, Daniela Bauer*

[274] **How does the presence of an oil phase influence the non-Fickian salt transport during low salinity waterflooding EOR?**

11:30 *Arman Darvish Sarvestani, Behzad Rostami, Hassan Mahani*

[281] **Effect of the connectivity of alluvial aquifers on groundwater flow and solute transport**

11:45 *anthony beaudoin, Alejandro Boschan, ivan Colecchio*

[278] **Impact of nanopores in clay on accessibility and connected porosity in sandstone samples**

12:00 *Md Fahim Salek, Fanqi Qin, Lauren Beckingham*

[385] **Modelling Transverse Anomalous Solute Transport in Highly Heterogeneous Porous Media**

12:15 *Aronne Dell Oca, Marco Dentz*

## Invited Parallel Session

Lecture Hall 1 13:40 - 14:15

**Chair:** *Ivan Yotov*

Come see how TESCAN changes micro-CT imaging! 13:40 - 13:45



**Eduardo Abreu** 13:45 - 14:15

University of Campinas (IMECC – UNICAMP)

### **Lessons from flows through porous media for solving nonlinear hyperbolic problems**

Hyperbolic problems and balance laws are relevant on the foundations of mathematical modeling and numerical simulation to the study of fluid dynamics in porous media. Such nonlinear models appear naturally in basic and applied sciences related to energy, climate, water, agriculture and they are also current events for a green world. We will discuss how fresh insights from flows through porous media on conservation properties, dimensional analysis and relaxation are key ingredients for construction of new effective schemes for solving hyperbolic transport models and a new desingularization analysis tool for construction of computationally stable numerical flux in locally conservative form. In fact, the approach is more general. We will also present advances in the mathematical modeling and design of a new class of positive Lagrangian-Eulerian schemes with rigorous numerical analysis for solving multidimensional hyperbolic-transport problems and related applications in geosciences.

## Invited Parallel Session (*cont.*)

Lecture Hall 2 13:40 - 14:15

**Chair:** Ralf Haese

Learn about Thermo Scientific analytical software solutions 13:40 - 13:45



**Sujit Datta** 13:45 - 14:15

Princeton University

### **Life in a Tight Spot: How Bacteria Swim, Disperse, and Grow in Porous Media**

Bacterial motility and growth play central roles in agriculture, the environment, and medicine. While bacterial behavior is typically studied in bulk liquid or on flat surfaces, many bacterial habitats -- e.g., soils, sediments, and biological gels/tissues -- are complex porous media. Here, using studies of *E. coli* in transparent 3D porous media, we demonstrate how confinement in a porous medium fundamentally alters bacterial behavior. In particular, we show how the paradigm of run-and-tumble motility is dramatically altered by pore-scale confinement, both for cells performing undirected motion and those performing chemotaxis, directed motion in response to a chemical stimulus. Our porous media also enable precisely structured multi-cellular communities to be 3D printed. Using this capability, we show how spatial variations in the ability of cells to perform chemotaxis enable populations to autonomously stabilize large-scale perturbations in their overall morphology. Finally, we show how when the pores are small enough to prevent cells from swimming through the pore space, expansion of a community via cellular growth and division gives rise to distinct, highly-complex, large-scale community morphologies. Together, our work thus reveals new principles to predict and control the behavior of bacteria, and active matter in general, in complex environments such as porous media.



## Oral presentations: Parallel sessions 5

### MS02: Porous Media for a Green World: Water & Agriculture

Lecture Hall 1

**Chairs:** *Jun Yin, Nima Shokri, Siva Rama Satyam Bandaru*

---

14:20	<b>[560] Optimizing laterite soil bed filters via predictive modelling and simulations</b> <i>Zahra Lakdawala</i>
14:35	<b>[483] Modeling colloid remobilization during temporal variation in ionic strength in porous media</b> <i>Sai Rama Krishna Yerramilli, Seetha N</i>
14:50	<b>[129] Climate change and primary soil salinization: A global scale perspective for the 21st century</b> <i>Amirhossein Hassani, Adisa Azapagic, Nima Shokri</i>
15:05	<b>[42] Analysis of evaporation and transport of stable water isotopologues in a coupled soil-atmosphere model</b> <i>Stefanie Kiemle, Katharina Heck, Rainer Helmig</i>

---

Oral presentations: Parallel sessions 5, cont.

## MS06-A: Physics of multiphase flow in diverse porous media

Lecture Hall 2

**Chairs:** *Saman Aryana, Signe Kjelstrup, Kristina Ariskina*

- |       |   |
|-------|---|
| 14:20 | [105] <b>The influence mechanism of pore structural properties on gas hydrate saturation and permeability via micro-CT technology</b><br><i>Huaimin Dong, Jianmeng Sun</i>      |
| 14:35 | [373] <b>Advanced Digital-SCAL measurements of gas trapping in sandstone</b><br><i>Ying Gao, Tibi Sorop, Hilbert van der Linde, Ab Coorn, Niels Brussee, Steffen Berg</i>       |
| 14:50 | [460] <b>Pore-scale imaging of hydrogen in porous media</b><br><i>Yihuai Zhang, Branko Bijeljic, Martin Blunt</i>   |
| 15:05 | [514] <b>Diffusion of methane and carbon dioxide within flexible kerogen from molecular dynamics simulations</b><br><i>Kristina Ariskina, Guillaume Galliero, Amael Obliger</i> |



Oral presentations: Parallel sessions 5, cont.

## MS22: Manufactured Porous Materials for Industrial Applications

G Auditorium

**Chairs:** *Senyou An, Vahid Niasar*

14:20	[8] <b>Adjoint-based topology optimization of porous structures</b> <i>Natalie Jüngling, Jennifer Niessner</i>
14:35	[436] <b>Additive Manufacturing of open porous structures: correlation of laboratory testing to simulations for application related properties</b> <i>Robert Otto, Uliana Soellner, Stefan Boschert, Christoph Kiener, Knut Sørby</i>
14:50	[220] <b>Fabrication, Characterization, and Testing of Architected 3D Graphene Foams</b> <i>Somayya Taher, Juveiriah M. Ashraf, Kin Liao, Rashid K. Abu Al-Rub</i>
15:05	[85] <b>How to design a 3D ordered microstructure for redox flow batteries: A pore network modeling study</b> <i>Mohammadjavad Shokriafr, Masoud Babaei, Vahid Niasar</i>

Oral presentations: Parallel sessions 5, cont.

## MS19: Electrochemical processes in porous media

Classroom G1

**Chairs:** *Qingyang Lin, Pablo Angel Garcia-Salaberry*

[12] **Superhydrophilic porous transport layer enhances efficiency of polymer electrolyte membrane electrolyzers**

14:20

*Benzhong Zhao, ChungHyuk Lee, Jason Lee, Kieran Fahy, Jacob LaManna, Elias Baltic, David Jacobson, Daniel Hussey, Aimy Bazylak*

[471] **Pore-network modeling of the two-phase flow and transport in the MPL-GDL double layer: model validation and exploration of optimal pore structures**

14:35

*Wenqian Zhang, Sidian Chen, John Xu, Chao-Zhong Qin, Bo Guo*

[490] **Investigating the effect of triple-phase boundary in zinc-air cathodes utilizing pore network modeling approach**

14:50

*Niloo Misaghian, Amin Sadeghi, Edward Roberts, Jeff Gostick*

[585] **Ex-situ visualization of wetting dynamics in a microporous layer of polymer electrolyte fuel cells by X-ray computed tomography under water vapor supply**

15:05

*Satoru Kato, Satoshi Yamaguchi, Yoriko Matsuoka, Akihiko Kato, Yasutaka Nagai, Takahisa Suzuki*

Oral presentations: Parallel sessions 5, cont.

**MS10: Advances in imaging porous media: techniques, software and case studies**

Classroom G2

**Chairs:** *Wesley De Boever, Siarhei Khirevich*

- 
- |       |   |
|-------|---|
| 14:20 | <p>[474] <b>Novel maximum entropy algorithm for multiscale pore network reconstruction and extension.</b><br/> <i>Rustem Sirazov, Aleksey Khlyupin, Kirill Gerke, Aleksei Samarin</i></p>   |
| 14:35 | <p>[59] <b>Use of advanced imaging techniques as a valuable tool to analyze the freeze-drying process in more detail in situ</b><br/> <i>Sebastian Gruber, Maximilian Thomik, Nicole Vorhauer-Huget, Frederik Coppens, Evangelos Tsotsas, Petra Först</i></p> |
| 14:50 | <p>[287] <b>Optimising Micro-CT Imaging Reconstruction Using Iterative Methods</b><br/> <i>Puyan Bakhshi, Chloé Maucuer, Omid Shahrokhi, M. Mercedes Maroto-Valer</i></p>   |
| 15:05 | <p>[421] <b>A Hybrid Multiscale Pore Network Modeling Method Applied to Complex Carbonate Rocks</b><br/> <i>Viswasanthi Chandra, Gwenole Tallec, arsalan Zolfaghari</i></p>   |
-

Oral presentations: Parallel sessions 5, cont.

## MS03: Flow, transport and mechanics in fractured porous media

Classroom C1

**Chairs:** *Hamid Nick, Olav Møyner, Holger Steeb*

---

[36] **Shrinkage-induced cracking in Opalinus Clay: investigation of crack modeling parameters and response in the CD-A experiment**

14:20

*Tuanny Cajuhi, Keita Yoshioka, Gesa Ziefle, Jobst Maßmann, Thomas Nagel, Wenqing Wang*

---

[70] **Matrix-fracture flow transfer in fractured porous media: experiments and simulations**

14:35

*Jiafan Guo, Zhechao Wang*

---

[292] **An experimental study of nonlinear flow behavior in fractured porous media by 3D printing technology**

14:50

*yunlong wu, Jean-Philippe Carlier, Nicolas BUR, Jean-Baptiste COLLIAT, Yun Jia*

---

[546] **Reactive Transport Modeling of Dissolution/Precipitation in Fractured Porous Media**

15:05

*Hossein Fazeli, Florian Doster*

---

Poster Exhibition: Session 4  
Exhibition Area 15:20 - 16:30

*Multiphase flow in porous media*

[26] **Two-equation macroscopic continuum model for drying capillary porous media: Benchmarking against pore network model simulations**  
*Faez Ahmad, Marc Prat, Evangelos Tsotsas, Abdolreza Kharaghani*

[401] **Computational and experimental microfluidics for geosciences**  
*Sophie Roman, Cyprien Soullaine*

[414] **Effects of porous media morphology on two-phase fluid displacement and distribution**  
*Harris Rabbani, Nima Shokri, Tannaz Pak*

[418] **Wettability Restoration of Reservoir Rocks: A Comparison between Static and Different Dynamic Methods**  
*Amin Rezaei, Yves Méheust*

[494] **2D Particle Tracking Velocimetry in Multiphase Flow in Porous Media**  
*Farzan Kazemifar, Jason Wong, Mingjia Xu*

*Interactions between flow and mechanics in porous media*

[34] **Chromatographic Effects in Inkjet Printing**  
*Gianmarco Venditti, Vignesh Murali, Anton Darhuber*

[249] **Complex Fluids – Thin Porous Materials Interactions revealed via Electrical Impedance Spectroscopy (EIS)**  
*Nicolae Tomozeiu, Hélder Marques Salvador, Hamid Mansouri*

[600] **Numerical study of single droplet drying in an acoustic levitator**  
*Martin Doß, Eberhard Bänsch, Nadja Ray,*

[606] **Print Quality and Particles: pore-scale simulations of particles/liquid interaction with printing substrate**  
*Hamed Aslannejad, Uebert Moreira, Franciane Rocha, Alfredo Jaramillo, Fabricio Sousa, Roberto Ausas, Gustavo Carlos Buscaglia*

Poster Exhibition: Session 4, cont.  
Exhibition Area 15:20 - 16:30

*Interactions between flow and mechanics in porous media, cont.*

[617] **A Potential Energy based Lattice Boltzmann Model for Two-Phase Flow in Fractured Porous Media**

Zhongkun Niu, zhengming yang, Yutian Luo, yapu zhang, Yilin Chang, Xinliang Chen, Xinli Zhao

[624] **Experimental study on porosity and permeability characteristics of unconventional reservoir under overburden pressure**

Xinliang Chen, zhengming yang, Xinli Zhao, yapu zhang, Zhongkun Niu, Wen Li, Yilin Chang

*Big data, uncertainty, machine learning and imaging in porous media*

[225] **Imaging and chemical analysis of ureteral stent encrustation and incrustation**

Tal Amitay-Rosen, Ishai Dror, Yaniv Shilo, Brian Berkowitz

[435] **Design of a model for the prediction of petrophysical properties from microstructural image data**

Mingze Jiang, Joyce Schmatz, Eva Wellmann, Jop Klaver

[523] **Forecasting water content in an irrigated field by Machine Learning Approach**

Marco Berardi, Anthony Giorgio, Fabio Difonzo, Gaetano Alessandro Vivaldi, Nicoletta Del Buono

[528] **Simplified simulation of two-phase flow in karst conduits in carbonate rocks**

Uebert Moreira, Franciane Rocha, Alfredo Jaramillo, Fabricio Sousa, Roberto Ausas, Gustavo Carlos Buscaglia

[530] **CO<sub>2</sub> storage site characterization using variational autoencoders**

Bao Jichao, Hongkyu Yoon, Jonghyun Lee

[578] **Surrogate models for aquifer management**

VANESSA A. GODOY, Janire Uribe-Asarta, Gian Napa, J. Jaime Gómez-Hernández



Oral presentations: Parallel sessions 6

**MS05: Biochemical processes and biofilms in porous media**

Lecture Hall 1

**Chairs:** *Sam Charlton, Roseanne Ford, Eleonora Secchi*

16:30	[51] <b>Mechanisms driving intermittency in preferential flow paths in porous media biofilms</b> <i>Dorothee Luise Kurz, Eleonora Secchi, Francisco Carrillo, Ian C Bourg, Roman Stocker, Joaquin Jimenez-Martinez</i>
16:45	[63] <b>Time evolution of biofilm' permeability field in porous media and control on fluid flow velocities</b> <i>Dorothee Luise Kurz, Eleonora Secchi, Roman Stocker, <u>Joaquin Jimenez-Martinez</u></i>
17:00	[106] <b>Visualizing biofilms within porous media using contrast-enhancing staining agents</b> <i><u>Laurenz Schröer</u>, Tim De Kock, Tim Balcaen, Greet Kerckhofs, Karel Folens, Nico Boon, Veerle Cnudde</i>
17:15	[482] <b>A novel platform for monitoring and imaging bacterial biofilm growth in complex structures</b> <i><u>Christos Papadopoulos</u>, Laurent Malaquin, Julie Foncy, Yohan Davit</i>
17:30	[423] <b>Engineering biofilm hydraulic resistance on the microscale</b> <i>Eleonora Secchi, Dorothee Luise Kurz, Cameron Boggon, <u>Sam Charlton</u></i>
17:45	[503] <b>Microfluidic study of biomass-growth induced changes on hydraulic properties. Investigation of growth characteristics under varying nutrient gas environments.</b> <i>Holger Ott, Neda Hassannayebi, Boris Jammernegg, <u>Patrick Jasek</u>, Hannes Konegger, Frieder Enzmann, Michael Kersten, Andreas Loibner, Martin Ferno</i>

Oral presentations: Parallel sessions 6, cont.

## MS06-B: Interfacial phenomena in multiphase systems

Lecture Hall 2

**Chairs:** *Ahmed M. Saad, Matteo Icardi*

---

[95] **Impact of Aqueous-phase Ions on Asphaltenic Crude Oil-Water Interfaces**

16:30 *Ahmed M. Saad, Stefano Aime, Sharath Mahavadi, Yi-Qiao Song, Maxim Yutkin, David A. Weitz, TADEUSZ PATZEK*

---

[121] **Comparison between secondary and tertiary low salinity waterflooding in carbonates: pore-scale processes, wettability changes and recovery**

16:45 *Ahmed Selem, Nicolas Agenet, Branko Bijeljic, Martin Blunt*

---

[339] **Pore-scale Assessment of Spontaneous Imbibition from Layer to Layer**

17:00 *Jamal Alaamri, Viswasanthi Chandra, Hussein Hoteit*

---

[479] **Numerical Simulation of Multi-phase Flow in Porous Media with a Phase-field Method**

17:15 *Lukas Maier, Manuel Hopp-Hirschler, Ulrich Niekem*

---

[426] **Liquid relative permeability through foam-filled porous media**

17:30 *Olivier PITOIS, Margaux Ceccaldi, Vincent Langlois, Marielle Guéguen, Daniel Grande, Sébastien Vincent-Bonnieu*

---

[191] **Effect of nanoparticles on the water-soluble polymers flow in porous media**

17:45 *Mohsen Mirzaie Yegane, Fatemeh Hashemi, Frank Vercauteren, Nicole Meulendijks, Ridha Gharbi, Pouyan Boukany, Pacelli Zitha*

---

Oral presentations: Parallel sessions 6, cont.

**MS11: Microfluidics and nanofluidics in porous systems**

G Auditorium

**Chairs:** *Hassan Mahani, Hossein Hejazi*

16:30	[111] <b>Influence of solute transport and capillarity on bubble evolution in porous networks</b> <i>Nerine Joewondo, Valeria Garbin, Ronny Pini</i>
16:45	[252] <b>Salt crystallization at a hydrophobic-hydrophilic interface in quasi 2D layered porous material.</b> <i>Rozeline Wijnhorst, Leo Pel, Noushine Shahidzadeh</i>
17:00	[257] <b>Novel Pore Scale Visualization during CO<sub>2</sub> Injection into CH<sub>4</sub> Hydrate Saturated Porous Media</b> <i>Jyoti Shanker Pandey, Ørjan Strand, Nicolas von Solms, Geir Ersland, Stian Almenningen</i>
17:15	[300] <b>Probing Multiscale Dissolution Dynamics in Natural Rocks through Microfluidics and Compositional Analysis</b> <i>Bowen Ling, Mo Sodwatana, Arjun Kohli, Cynthia M. Ross, Adam Jew, Anthony Kovscek, Ilenia Battiato</i>
17:30	[473] <b>On the Challenges of Pore Scale Models to Capture Minerals Precipitation and Dissolution in microfluidic setups: A Combined Computational-Lab-on-a-Chip Approach</b> <i>Mohamed Mahrous, Jenna Poonoosamy, Enzo Curti, Sergey Churakov, Nikolaos Prasiankis</i>
17:45	[500] <b>PIV and Microfluidic Investigation of recirculation induced reaction hot spots in porous media</b> <i>Michael Chen, Sang Lee, Peter Kang</i>

Oral presentations: Parallel sessions 6, cont.

## MS13: Fluids in Nanoporous Media

Classroom G1

**Chairs:** *Hicham Dialla, Elizabeth Barsotti*

---

[61] **Elasticity of Liquid Nitrogen in Nanoporous Vycor Glass**

16:30 *Klaus Schappert, Rolf Pelster*

---

[408] **A New Precise Correlation for Permeability Estimation of Tight Carbonate Rocks Using Mercury Intrusion Porosimetry (MIP) Data**

16:45 *Amin Rezaei, Yves Méheust*

---

[432] **Impact of salt on sorption isotherms of water in nanoporous media**

17:00 *Hugo Bellezza, Busch Mark, Stella Gries, Juan Sanchez, Patrick Huber, Olivier Vincent*

---

[40] **Extension of the SAFT equation of state to capture the effect of the solid wall into the confined fluid properties: using molecular dynamic simulation**

17:15 *Sajjad AhmadiGoltepeh, Rohaldin Miri, Per Aagaard, Helge Hellevang*

---

[263] **Confined phase behavior of a CH<sub>4</sub>-CO<sub>2</sub> binary system: molecular simulations, equation of state, and lattice Boltzmann method**

17:30 *Lingfu Liu, Carlos Nieto-Draghi, Véronique Lachet, Heidaryan Ehsan, Saman Aryana*

---

[57] **Molecules diffusing and relaxing in macro, meso and microporous materials: An NMR approach for studying the behaviour of fluids confined in nanoporous media**

17:45 *Carmine D'Agostino*

---

Oral presentations: Parallel sessions 6, cont.

**MS15: Machine Learning and Big Data in Porous Media**

Classroom G2

**Chairs:** *Hongkyu Yoon, Nikolai Andrianov*

16:30 [1] **Image-based Petrophysical Characterization of Porous Media: A Comparative Study of Common Deep-learning-based Denoising Algorithms**  
*Miral Tawfik, Amogh Adishesha, Yuhan Hsi, Prakash Purswani, Russell Johns, Parisa Shokouhi, Xiaolei Huang, Zuleima Karpyn*

16:45 [149] **Towards Pore Super Segmentation on Artificially Enhanced SEM Images of Opalinus Clay by Voting Classification**  
*Marco Brysch, Ben Laurich, Christoph Schettler, Monika Sester*

17:00 [299] **Machine/Deep Learning Methods for Pore-Mineral Characterization and Surface Areas Analysis**  
*Lauren Beckingham, Parisa Asadi*

17:15 [448] **Fitting correlation-based and neural-network-based relative permeability models to a large dataset of forced and spontaneous imbibition experiments**  
*Helton Magno Ciriaco, Hamid M. Nick, Ali Akbar Eftekhari*

17:30 [48] **Estimating permeability of real-rock micro-CT images by physics-informed neural networks**  
*Stephan Gärttner, Faruk Omer Alpak, Andreas Meier, Nadja Ray, Florian Frank*

17:45 [309] **10,000-cubed Digital Rock Analysis: Beyond Hardware Super Resolution Imaging and Efficient HPC Modelling**  
*Ying Da Wang, Ryan Armstrong, Peyman Mostaghimi*

Oral presentations: Parallel sessions 6, cont.

## MS12: Advances in modeling and simulation of poromechanics

Classroom C1

**Chairs:** Jianchao Cai, Joshua White, Thomas Sayet

- 
- 16:30 [72] **NMR characterization of critical boundary of pore fluid in shale**  
*XU DONG, Bo Liu, Lijuan Cheng, Yangchuan Lin, Yue Jin, Xue Han*
- 
- 16:45 [237] **Study on the distribution characteristics of in-situ stress of Chang 7 reservoir in Ordos Basin**  
*Hou bing, Zuo luo, xiaoxuan Kou, Zhang yu, Li Zhuang*
- 
- 17:00 [260] **Multimodal geo-dynamic flow characterization in heterogeneous carbonate reservoir: An integrated approach linking static and dynamic behavior**  
*Jiaheng Chen, Liping Yi, Liang Wei, Yongjun Wang, Chaozhong Ning, Guangya Zhu*
- 
- 17:15 [298] **A probabilistic approach dedicated to the prediction of the reactive mass transport in porous media**  
*Thomas SAYET, Lukas Jakabcin, Athanasios Batakis*
- 
- 17:30 [565] **The yield surface of reservoir chalk from the North Sea: influence of age, mineralogy and water saturation.**  
*Frédéric Amour, Mohammad Reza Hajiabadi, Hamid M. Nick*
-

## Better Care for a Better World

starts by taking care of you and giving you what you need to succeed. We're dedicated to breaking down barriers to speed up decision making and creating a workplace with relentless focus on our consumers and growing our people, like you.

The proof is in our people – we've been rated as one of Forbes 2021 World's Best Employers, and it's because of the caring people and the amazing culture that brings out the best in everyone.

Join our employees in our amazing culture  
that brings out the best in everyone.

[CareersatKC.com](https://www.careersatkc.com)

For Kimberly-Clark to grow and prosper, we must be an inclusive organization that applies the diverse experiences and passions of its team members to brands that make life better for people all around the world.

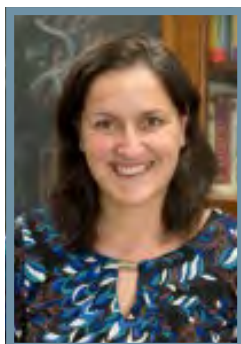
We actively seek to build a workforce that reflects the experiences of our consumers. When you bring your original thinking to Kimberly-Clark, you fuel the continued success of our enterprise. We are a committed equal opportunity employer and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability status, protected veteran status, sexual orientation, gender identity, age, pregnancy, genetic information, citizenship status, or any other characteristic protected by law.

## Plenary Session

Main Auditorium 8:30 - 9:20

**Chair:** *Azita Ahmadi-Senichault*

## Award Ceremony 8:30 - 8:40



### **InterPore Medal for Porous Media Research**

Masa Prodanovic

*The University of Texas at Austin, USA*

The InterPore Medal for Porous Media Research (formerly InterPore Award for Excellence in Porous Media Research) is given to scientists with an established career, in recognition of excellent research in general porous media, with emphasis on research conducted over the past 10 years.

Awardees are senior scientists who have an excellent research record that has contributed to the theoretical, experimental and/or modelling advances in understanding of problems involving natural and/or



### **InterPore Award for Porous Media Research**

Sujit S. Datta

*Princeton University, USA*

The InterPore Award for Porous Media Research (formerly Procter & Gamble Award for Thin and Swelling Porous Media Research) is given to mid-career researchers in recognition of outstanding research in general porous media, with emphasis on research conducted over the past 5 years.



## Plenary Lecture 8:40 - 9:20



**Peng Xu**  
China Jiliang University

### **Fractal Theory of Porous Media**

Over the past four decades, fractal geometry has sparked considerable interest in many disciplines to characterize irregular and disorder objects that traditional Euclidean geometry fails to analyze. Since Katz and Thompson presented experimental evidence indicating that pore spaces of sandstone are self-similar in 1985, fractal geometry has been successfully applied into variety of porous media such as soil, rock, coal, shale, fiber, wood, ceramic, concrete, tissue, etc. In this talk, I will firstly review the background and applications of fractal geometry in porous media. And the fractal theory and methods to characterize and reconstruct the complex structures of porous media are illustrated. I will also introduce the fractal models for the transport properties of porous media.



Poster Exhibition: Session 5  
Exhibition Area 9:20 - 10:30

## Porescale systems and microfluidics

**[53] Challenges for Microfluidic Devices in Representing Flow in Geological Formations**

*Simon Cox, Afshin Davarpanah, William Rossen*

**[56] Relative Permeabilities in Steady Two-Phase Flow in Microfluidic Devices**

*Ewald Obbens, William Rossen, Simon Cox,*

**[170] 3D Microscale Flow Simulation of Newtonian and Shear Thinning Fluids in Sandstone and Carbonate Samples**

*Mehdi Amiri, Jafar Qajar, Ali Qaseminejad Raeini*

**[186] Micro experimental study on residual oil of marine carbonate rocks during water flooding based on CT scanning**

*Wenlong Jing, Aifen Li, Lei Zhang, Hai Sun, Jun Yao*

**[211] Microporosity-permeability relationship for complex South East Asia carbonate reservoir**

*Wen Pin Yong, Sebastian Geiger, Hannah Menke, Kamaljit Singh, Julien Maes*

**[244] The influence of Wettability and flow rates on two-phase fluid displacement in porous media: Pore scale experimental visualization and numerical simulations**

*Peixing Xu, nong kang, Congjiao Xie, Shuangmei Zou*

## Multiphase flow in porous media

**[6] Characterization of Fluid-Fluid Interactions in Heterogeneous Porous Media**

*Artur Shapoval, Sheik Sheik Rahman, Mohammed Alzahrani*

Poster Exhibition: Session 5, cont.  
Exhibition Area 9:20 - 10:30

*Multiphase flow in porous media, cont.*

**[91] Cr(III)-entrapped Nanocapsules Obtained via W/O/W Double Miniemulsion Nanoprecipitations of Hydrophobic Polymers for Delaying HPAM Gelation**

*Jingyang Pu, Keith Johnston*

**[193] Experimental Investigation of Relative Permeability Curves in Oil/water Transition Zone of Tight Sandstone Reservoir**

*min ma, Aifen Li*

**[213] Effect of pore structure characteristics on imbibition recovery of shale with different fabric facies**

*Qinghao Sun, Yuliang Su, Jilong Xu, Wendong Wang, Xincheng Guo, Guanqun Li, Tianyu Zhang*

**[224] Impact of Novel Nano-particle Solutions on Foam Stability, Wettability Reversal and Interfacial Tension Reduction**

*Mohammad Rezaee, Seyed Mojtaba Hosseini-Nasab, Jalal Fahimpour, Mohammad Sharifi*

*Interactions between flow and mechanics in porous media*

**[13] Experimental study on silylated polyacrylamide based relative permeability modifiers in porous carbonate gas cores**

*Liming Qin, Ali Saeedi, Colin Wood, Claus Otto, Matt Myers*

**[43] Insights into Upscaling of Modeling of Thermal Dispersion in Geothermal Doublets**

*Jinyu Tang, Pelle van Nieuwkerk, William Rossen*

**[108] Experimental Studies on Permeabilities of Thin Fibrous Materials**

*Luwen Zhuang, S. Majid Hassanizadeh*

**[276] Heterogeneous nucleation and precipitation on solid surfaces: Experimental observation of calcium carbonate formation on primary and secondary substrates**

*Mohammad Nooraiepour, Mohammad Masoudi, Nima Shokri, Helge Hellevang*

# WEDNESDAY, 01 JUNE 2022

Poster Exhibition: Session 5, cont.  
Exhibition Area 9:20 - 10:30

*Interactions between flow and mechanics in porous media, cont.*

[311] **Investigation of coupled processes in fractures and the bordering matrix via a micro-continuum reactive transport model**

*Qian Zhang, Deng Hang, Yanhui Dong, Sergi Molins*

[394] **High Precision Saline Intrusion Modelling in Heterogeneous Aquifers using Dynamic Mesh Optimisation**

*Pablo Salinas, Meissam Bahlali, Carl Jacquemyn, Christopher C. Pain, Adrian P. Butler, Matthew D. Jackson*

[437] **Effect of physicochemical properties and structural heterogeneity on reactive transport in saturated porous media**

*Jianying Shang, Jinhui Tong, Xiaofan Yang, Xueming Li, Yuanyuan Liu*

Wednesday Detailed Program

**STET** Science and Technology for Energy Transition

[www.stet-review.org](http://www.stet-review.org)

To access the academic journal

**STET**  
Science and Technology for Energy Transition

- open-access WoS journal focused on energy transition
- original research papers, reviews, and special issues
- no publication costs for authors

**Shell TechXplorer Digest**  
2021

A magazine that showcases the breadth and depth of scientific research and technology applications within Shell.

<https://www.shell.com/energy-and-innovation/shell-techexplorer-digest-2021.html>  
#ShellTechXplorerDigest

## Oral presentations: Parallel sessions 7

### MS01: Porous Media for a Green World: Energy & Climate

Lecture Hall 1

**Chairs:** *William Rossen, Eleni Stavropoulou*

10:30	[66] <b>A micro-scale analysis for wettability characteristics of H2 in heterogeneous geological media</b> <i>Maartje Boon, Leila Hashemi, Willemijn van Rooijen, Rouhi Farajzadeh, Hadi Hajibeygi</i>
10:45	[175] <b>3D Visualization of hydrogen storage in sandstones at reservoir conditions</b> <i>Zaid Jangda, Andreas Busch, Sebastian Geiger, Kamaljit Singh</i>
11:00	[379] <b>Analytical analysis of wettability in hydrogen-rock-brine systems</b> <i>Farzaneh Nazari, Rouhi Farajzadeh, Vahid Niasar</i>
11:15	[304] <b>Modeling and Simulation of Long-term Wettability Alteration on CO<sub>2</sub> Storage Efficiency and Containment</b> <i>Sarah Gasda, David Landa Marbán, Abay Kassa, Kundan Kumar, Tor Harald Sandve</i>
11:30	[192] <b>Trapping dynamics during geological carbon storage: Synchrotron time-lapse imaging of pore-scale capillary trapping events over the centimetre-scale in a heterogenous sandstone.</b> <i>Catrin Harris, Ann Muggeridge, Sam Krevor, Samuel Jackson</i>
11:45	[265] <b>A Field-Data Based Numerical Investigation of Factors Controlling CO<sub>2</sub> Plume Migration in Storage Candidate Sites</b> <i>Qi Shao, Maartje Boon, AbdAllah Youssef, Stephan Matthai, Sally Benson</i>
12:00	[541] <b>Monitoring of Brine Leakage form Carbon Storage in Deep Saline Formations: Method Validation Using Intermediate-Scale Testing</b> <i>Tissa Illangasekare, Ahmad Askar</i>

# WEDNESDAY, 01 JUNE 2022

Oral presentations: Parallel sessions 7, cont.

## MS06-A: Physics of multiphase flow in diverse porous media

Lecture Hall 2

**Chairs:** Sharon Ellman, Saman Aryana

Wednesday Detailed Program

- 
- |       |   |
|-------|---|
| 10:30 | <b>[55] Predicting and measuring pore-scale capillary pressures associated with meniscus movements during slow imbibition</b><br><i>Sharon Ellman, Arjen Mascini, Tom Bultreys</i>  |
| 10:45 | <b>[94] A quantitative study of oil mobilization induced by water diffusion in n-alkane phases: from pore-scale experiments to molecular dynamic simulation</b><br><i>LIFEI YAN, Yuanhao Chang, S. Majid Hassanizadeh, Senbo Xiao, Amir Raoof, Carl Fredrik Berg, Jianying He</i> |
| 11:00 | <b>[407] Jaynes Statistical Mechanics Applied to Multiphase Flow in Porous Media</b><br><i>Alex Hansen, eirik flekkøy, Per Arne Slotte, Santanu Sinha</i>   |
| 11:15 | <b>[463] Extension and Uncertainty Modeling of Imbibition Processes using the Morphological Method – a Reality Check</b><br><i>Pit Arnold, Mario Dragovits, Fatime Zekiri, Sven Linden, Holger Ott</i>  |
| 11:30 | <b>[502] Viscous, gravitational and capillary forces in 3D experiments with a synthetic porous media</b><br><i>Joachim Falck Brodin, Per Arne Rikvold, Knut Jorgen Maloy, Marcel Moura, Mihailo Jankov</i>  |
| 11:45 | <b>[532] Thermodynamics of continuum scale immiscible and incompressible two-phase flow in porous media: A statistical mechanics approach using the Color Lattice-Boltzmann model</b><br><i>Håkon Pedersen, Santanu Sinha, Alex Hansen</i>  |
| 12:00 | <b>[489] PORE-TO-CORE LINKAGES AND UPSCALING FOR GAS INJECTION (CO<sub>2</sub> STORAGE, EOR) IN CARBONATES</b><br><i>Sojwal Manoorkar, Senyou An, Sam Krevor</i>  |
-

Oral presentations: Parallel sessions 7, cont.

## MS22: Manufactured Porous Materials for Industrial Applications

G Auditorium

**Chairs:** *Senyou An, Oleg Iliev*

10:30	<p>[271] <b>THE EFFECT OF POROSITY AND PORE STRUCTURE ON THE ACCUMULATION OF PARTICLES INTO CELLULOSIC FIBROUS FILTERS</b></p> <p><i>Antti Koponen, Jussi Virkajärvi, Kimmo Heinonen, Tuomas Turpeinen</i></p>
10:45	<p>[610] <b>Linking structure and catalytic properties of automotive and heterogeneous catalysts for industrial applications through X-ray nanotomography, scanning electron microscopy and cryogenic focused ion beam microscopy in three dimensions</b></p> <p><i>Andy Holwell, Maadhav Kothari, Markus Boese</i></p>
11:00	<p>[144] <b>Direct Solar Membrane Distillation Device with Micro-3D Printed Spacer and Titanium Mesh</b></p> <p><i>Abdul-Rahman Kharbatli, Hongxia Li, Alaa Shaheen, Faisal AlMarzooqi, Tiejun Zhang</i></p>
11:15	<p>[110] <b>Optimisation and characterisation of a dual porosity medical grade porous medium for personalised inkjet printed dosages applications</b></p> <p><i>Hamed Aslannejad, Tamanna Lashkari, Elmin Breejen, Robbert Jan kok, Rainer Helmig, Oliver Röhrle, S. Majid Hassanizadeh</i></p>
11:30	<p>[134] <b>Initial Yield Surface of Cellular Sheet TPMS Lattices</b></p> <p><i>Nareg Baghous, Barsoum Imad, Rashid K. Abu Al-Rub</i></p>
11:45	<p>[301] <b>Sherwood number correlation for reverse osmosis membrane systems in turbulent regime</b></p> <p><i>Siqin Yu, Bowen Ling, Ilenia Battiato</i></p>
12:00	<p>[551] <b>Gold Nanocomposite Contact Lenses for Ocular Health Management</b></p> <p><i>Haider Butt, Ahmed E. Salih, Mohamed Elsherif, Fahad Alam</i></p>

Oral presentations: Parallel sessions 7, cont.

## MS07: Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Classroom G1

**Chairs:** *Jakub Both, Carina Bringedal, Manuela Bastidas*

- |       |   |
|-------|---|
| 10:30 | <b>[9] The numerical solution of the micro-scale phase-field equation and its role in a two-scale two-phase flow model.</b><br><i>Manuela Bastidas, Sohely Sharmin, Carina Bringedal, Iuliu Sorin Pop</i> |
| 10:45 | <b>[47] Upscaling of phase-field models for two-phase flow based on fluid morphology</b><br><i>Mathis Kelm, Carina Bringedal, Bernd Flemisch</i>  |
| 11:00 | <b>[60] Micro-macro models for reactive two-mineral systems</b><br><i>Nadja Ray, Stephan Gärttner, Peter Frolkovic, Peter Knabner</i>   |
| 11:15 | <b>[88] A phase-field approach to model evaporation in porous media: Upscaling from pore to Darcy scale</b><br><i>Tufan Ghosh, Carina Bringedal</i>   |
| 11:30 | <b>[130] Upscaling and Automation: Pushing the Boundaries of Multiscale Modeling through Symbolic Computing</b><br><i>Kyle Pietrzyk, Svyatoslav Korneev, Morad Behandish, Ilenia Battiato</i>             |
| 11:45 | <b>[501] Population Balance Equation for Porous Media: Upscaled Dynamics and Evolution</b><br><i>Nicodemo Di Pasquale, Matteo Icardi</i>  |
| 12:00 | <b>[539] Influence of Pore Morphology on Mechanical Properties of Second Gradient Materials</b><br><i>Pania Newell, Bozo Vazic</i>  |



Oral presentations: Parallel sessions 7, cont.

## MS15: Machine Learning and Big Data in Porous Media

Classroom G2

**Chairs:** *Patrick Huber, Nikolai Andrianov*

10:30	[360] <b>U-FNO - an enhanced Fourier neural operator-based deep-learning model for multiphase flow</b> <i>Gege Wen, Zongyi Li, Kamyar Azizzadenesheli, Anima Anandkumar, Sally Benson</i>
10:45	[359] <b>Reduced order modeling with Barlow Twins self-supervised learning: Navigating the space between linear and nonlinear solution manifolds</b> <i>Teeratorn Kadeethum, Francesco Ballarin, Daniel O'Malley, Youngsoo Choi, Nikolaos Bouklas, Hongkyu Yoon</i>
11:00	[341] <b>Physics-enhanced Convolutional Neural Networks for Predicting Effective Dispersion in Porous Media</b> <i>Ross Weber, Ilenia Battiato</i>
11:15	[561] <b>Deep Learning Accelerated History Matching and Forecasting for Geologic CO2 Sequestration</b> <i>Bailian Chen, Bicheng Yan, Qinjun Kang, Rajesh Pawar</i>
11:30	[101] <b>Data-driven production optimization utilizing multi-objective particle swarm algorithm based on ensemble-learning proxy model</b> <i>Shuyi Du, Hongqing Song, Chiyu Xie, Wang Jiulong</i>
11:45	[159] <b>Data-Driven Physics-informed Interpolation Evolution Combining Historical-Predicted Knowledge for Remaining Oil Distribution Prediction</b> <i>Jingwei Zhu, Chiyu Xie, Jiulong Wang, Shuyi Du, Hongqing Song</i>
12:00	[284] <b>Upscaling of Realistic Discrete Fracture Simulations Using Machine Learning</b> <i>Nikolai Andrianov</i>

Oral presentations: Parallel sessions 7, cont.

## MS03: Flow, transport and mechanics in fractured porous media

Classroom C1

**Chairs:** *Hamid Nick, Hongkyu Yoon*

- 
- 10:30 [33] **Numerical simulation of desiccation crack nucleation and propagation by a variational phase-field model**  
*Keita Yoshioka, Tuanny Cajuhi, Thomas Nagel, Olaf Kolditz, Wenqing Wang*
- 
- 10:45 [189] **on the deformation of porous medium by pressurized flow**  
*arnold bachrach, yaniv edery*
- 
- 11:00 [343] **Consistent Treatment of Shear Failure of Embedded Discrete Fracture Networks Using XFVM**  
*Giulia Conti, Rajdeep Deb, Stephan Matthai, Patrick Jenny*
- 
- 11:15 [356] **Coupled poro-elasto-plasticity of geomaterials: Simulation and validation**  
*Maria Warren, James Bean, R Charles Choens, Mario Martinez, Alec Kucala, Hongkyu Yoon*
- 
- 11:30 [457] **An Uncertainty Quantification Workflow for Naturally Fractured Reservoirs using Proxy Modelling based on Poro-mechanically Informed Flow Diagnostics Simulations**  
*Lesly Gutierrez Sosa, Sebastian Geiger, Florian Doster*
- 
- 11:45 [531] **Proppant Transport and Coverage in Rock Fractures –A Computational Modeling Approach**  
*Farid Roustae, Amir Mofakham, Dustin Crandall, Goodarz Ahmadi*
-

## Invited Parallel Session

Lecture Hall 1 13:25 - 14:00

**Chair:** *Philippe Coussot*

Learn about MDPI Computation, a journal of computational science 13:25 - 13:30



**Dominique Derome** 13:30 - 14:00

Université de Sherbrooke

### **Hysteresis of mass transport in porous media**

A discussion on the occurrence of hysteresis in different aspects of mass transport in porous media, including contact angle of advancing and receding flow in capillaries, occurrence of capillary condensation hysteresis at mesopore scale and hysteretic swelling of hygroscopic polymers upon sorption. Relevance of considering hysteresis in computational modeling, namely lattice Boltzmann and atomistic modeling.



## Invited Parallel Session (cont.)

Lecture Hall 2 13:25 - 14:00

**Chair:** Ivan Deshnenkov

Learn about STET journal: a new open-access and open-science journal devoted to energy transition 13:25 - 13:30



**Zuleima Karpyn** 13:30 - 14:00

Penn State University

### **Experimental Investigation of Conditions Favoring Enhanced Gas Storage in Shales**

Shale gas reservoirs are currently viewed as an emergent opportunity to sustain growing energy needs while reducing the carbon intensity of energy systems relative to other fossil fuels. However, these reservoirs are geologically complex in their chemical composition and dominance of nano-scale porosity, resulting in limited predictability of their effective storage capacity. To predict gas storage and estimate volumetric gas-in-place, in-situ gas properties need to be defined. However, only a few direct experimental measurements on in-situ gas properties are available in the literature, and the interactions between gas and the surrounding surface area of the medium remain poorly understood. In this study, gas invasion experiments were conducted in conjunction with X-ray microCT imaging on three different shales, i.e., Bakken, Haynesville and Marcellus. Results show evidence of enhanced storage capacity in all cases, with different degrees of gas densification across the three shale specimens. The average of measured in-situ xenon density within the Bakken, Haynesville and Marcellus shale samples were found to be 171.53kg/m<sup>3</sup>, 326.05kg/m<sup>3</sup> and 947kg/m<sup>3</sup>, respectively. These measured densities are higher than their corresponding theoretical free gas density, though lower than the xenon density at boiling point, indicating that current practices of estimating adsorbed gas and gas in place, using boiling point liquid density, may be overestimated. The xenon densification factor in the Marcellus sample was found to be 7.4, indicating the most significant degree of localized densification. This densification factor drops to 2.6, and to 1.4, in the Haynesville and the Bakken sample, respectively. Characterization of shale composition and pore structure are discussed, in order to assess the shale properties favoring enhanced gas storage. Statistical results indicate that compositional properties are weakly correlated with gas densification, while pore structure is a strong indicator of gas densification levels in shales. The findings in this work lay a foundation to evaluate enhanced storage capacity for various gases in ranging tight formations.

## Oral presentations: Parallel sessions 8

### MS05: Biochemical processes and biofilms in porous media

Lecture Hall 1

**Chairs:** *Dorothee Kurz, Valentina Prigiobbe, Anozie Ebigbo*

- 
- 14:05 [145] **Transport of *Sporosarcina Pasteurii* in porous saturated sands and applications on soil improvement**  
*Gujjie Sang, Rebecca Lunn, James Minto, Gráinne El Mountassir*
- 
- 14:20 [285] **Optimization of injection strategies for field-scale leakage remediation using microbially induced calcite precipitation**  
*Svenn Tveit, David Landa Marbán*
- 
- 14:35 [264] **A quantitative study of the effect of pore-scale heterogeneity on MICP in meter-long microfluidic porous media analogues**  
*Ariadni Elmaloglou, Dimitrios Terzis, Pietro De Anna, Lyesse Laloui*
- 

### MS06-A: Physics of multiphase flow in diverse porous media

Lecture Hall 2

**Chairs:** *Qi Liu, Ying Gao*

- 
- 14:05 [364] **Preferential Flow of Emulsion through Homogeneous Porous Media**  
*Ke Xu, Qingrong He, Wei Yang*
- 
- 14:20 [427] **Hysteresis in Contact Angle and Interfacial Tension: Implications on Multiphase Flow**  
*Qi Liu, Marcelo Benitez, Carlos Santamarina*
- 
- 14:35 [485] **Dynamic Behaviours of Foam Flooding assisted by Newtonian and non-Newtonian Viscosifying Agents in Porous Media**  
*Seyed Mojtaba Hosseini-Nasab, Martin Taal, Mohammad Rezaee, Pacelli Zitha*
-

Oral presentations: Parallel sessions 8, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** Yongfei Yang, Stéphane Zaleski, Mohammad Masoudi

- |       |   |
|-------|---|
| 14:05 | [177] <b>Can we trust computers to analyse pore-scale images?</b><br><i>Peyman Mostaghimi, Ryan Armstrong, Ying Da Wang</i>   |
| 14:20 | [367] <b>On a workflow for efficient computation of the permeability of tight sandstones</b><br><i>Vladislav Pimanov, Ekaterina Muravleva, Denis Orlov, Dmitry Koroteev, Oleg Iliev, Vladislav Lukoshkin, Pavel Toktaliev</i> |
| 14:35 | [372] <b>Pore-scale study on convective drying of porous media by the lattice Boltzmann method</b><br><i>Linlin Fei, Feifei Qin, Jianlin Zhao, Dominique Derome, Jan Carmeliet</i>  |

## MS07: Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Classroom G1

**Chairs:** Jakub Both, Michel Kern, Manuela Bastidas

- |       |  |
|-------|--|
| 14:05 | [308] <b>A multipoint stress-flux mixed finite element method for the Stokes-Biot fluid poroelastic structure interaction model</b><br><i>Sergio Caucao, Tongtong Li, Ivan Yotov</i> |
| 14:20 | [405] <b>Reliable and efficient error estimates for nonlinear flow processes using linear iterative schemes</b><br><i>Koondi Mitra, Martin Vohralik</i>                              |
| 14:35 | [517] <b>Positive DDFV scheme for degenerate parabolic equations arising from infiltration problem</b><br><i>Mazen Saad, El Houssaine Quenjel, Ben Mansour DIA</i>                   |

Oral presentations: Parallel sessions 8, cont.

## MS12: Advances in modeling and simulation of poromechanics

Classroom C1

**Chairs:** *Joshua White, Jianchao Cai, Omar Al-Farisi*

- 
- |       |  |
|-------|--|
| 14:05 | <b>[458] Study on Microscopic Imbibition process in Variable Diameter Capillary Tubes</b><br><i>Lihua Shi, Shiqing Cheng, Yuwen Chang, Binchi Hou</i>                        |
| 14:20 | <b>[464] Experimental Research of Spontaneous Water Imbibition in Oil-Saturated Reservoirs with Ultra-low Permeability</b><br><i>Hailong Dang, Hanqiao Jiang, Binchi Hou</i> |
| 14:35 | <b>[537] A macro-scale elasto-thermo-viscoplastic constitutive model for saturated frozen soils</b><br><i>Dana Amini, Maghoul Pooneh, Hollaender Hartmut</i>                 |
- 

# Canon

## CANON PRODUCTION PRINTING

Canon is a globally recognized brand that manufactures a wide range of products, among others in the field of printing, cameras, medical and industrial equipment. Canon Production Printing is an international leader in digital document management and printing for professionals, developing and manufacturing high-tech printing products and workflow software for the commercial printing market. Many Fortune 500 companies and leading commercial printers use Canon solutions for wide format printing, high-speed production printing and document-related business services. Canon employs 3,000 specialists at innovation and technology centres in Europe and Asia. Through its own R&D, it develops core technologies and the majority of their its product concepts.

<https://cpp.canon>

Poster Exhibition: Session 6  
Exhibition Area 14:50 - 16:00

## Porescale systems and microfluidics

[81] **Particle migration and deposition at the pore scale: Eulerian-Lagrangian approach**

*Saeid Sadeghnejad, Frieder Enzmann, Michael Kersten*

[171] **The Effect of Power Law Index on Shift Factor for Shear Thinning Fluids by 3D Microscale Flow Simulation**

*Mehdi Amiri, Jafar Qajar, Ali Qaseminejad Raeini*

[352] **The Effect of Interfacial Elasticity of a Nanofluid/Surfactant system for EOR through a Visual Micromodel Study**

*Hector Bonilla, S. H. Hejazi*

[358] **Hydrodynamic instabilities of immiscible fluids in a Hele-Shaw cell**

*Chekib Ghabi, Hamid Abderrahmane, Mohamed Sassi*

[580] **Application of Lattice Boltzmann Method in Pore-scale Characterisation of Flow Dynamics in Three-Dimensional Porous Medium**

*Mehrdad Vasheghani Farahani, Mohaddeseh Mousavi Nezhad*

## Multiphase flow in porous media

[64] **The influence of gas bubble interfaces on the acoustic properties of partially saturated poroelastic media**

*Patrick Kurzeja, Holger Steeb*

[107] **Experimental evaluation of percolation in evolution of flow**

*Samaneh Vahid Dastjerdi, Nikolaos Karadimitriou, S. Majid Hassanizadeh, Holger Steeb*

[315] **Evaluation of fluid flow behavior and trapped non-wetting phase saturation with modified pore morphological approach in clastic reservoirs**

*Fatime Zekiri, Gordon Burmester, Hrvoje Jurcic, Pit Arnold, Holger Ott*



## Poster Exhibition: Session 6, cont. Exhibition Area 14:50 - 16:00

### *Multiphase flow in porous media, cont.*

[330] **Microfluidic experiments on constrained oil remobilization induced by water transport in the oil phase**

*LIFEI YAN, Amir Raoof, S. Majid Hassanizadeh*

[334] **A Novel Analysis Method for Water Breakthrough Mechanism in an Offshore Heavy Oil Reservoir with Bottom Water**

*Guangming Pan, Kai Kang, Jianting Huang, Jifeng Qu, PENG SHI*

[415] **The Influence of Imaging Contrast Agents on Emulsification under Flow Conditions**

*Ahmad Kharrat, Mostafa Borji, Bianca Brandstätter, Holger Ott*

[534] **Onsager-symmetry in athermal two-phase flow in porous media with the Lattice-Boltzmann model**

*Håkon Pedersen, Christian Ulrichsen, Signe Kjelstrup, Dick Bedeaux, Santanu Sinha*

### *Interactions between flow and mechanics in porous media*

[226] **Evaluation of saturation of tight sandstones using dielectric logs: Ordos Basin, China**

*peiqiang zhao, Zhiqiang Mao, Gaoren Li, Haopeng Guo*

[255] **Three-dimensional Accurate Modeling and Metal Seepage Study of Coal-based Porous Media**

*Qili Wang, Jiarui Sun, Jianwen Hu*

[266] **Numerical Investigations on the Dissolution Characteristics of CO<sub>2</sub> in Fractured Porous Media using Density Driven Modelling**

*Manojkumar Gudala, Bicheng Yan, Shuyu Sun*

[466] **Decontamination-induced contaminant redistribution in porous media**

*Emily Butler, Francesco Paolo Conto, Merlin Aragon Etzold, Stuart B. Dalziel, Joel Daou, Julien R. Landel*

[469] **Montecarlo simulations of gas transportation in multifractal shale reservoirs**

*Paul Naveen, Debjeet Mondal*

# WEDNESDAY, 01 JUNE 2022

Oral presentations: Parallel sessions 9

## MS20: Biophysics of living porous media: theory, experiment, modeling and characterization

Lecture Hall 1

**Chairs:** *Philippe Coussot, Tobias Koepl, Fred Vermolen*

- 
- |       |   |
|-------|---|
| 16:00 | <p>[37] <b>Two-step diffusion in cellular hygroscopic (vascular plant-like) materials</b><br/><i>Philippe Coussot, Benjamin Maillet, Rahima Sidi-Boulenouar, Sabine Caré</i></p>  |
| 16:15 | <p>[75] <b>Reduced-order model to investigate cell-scale hemodynamics through disordered porous networks of the human placenta</b><br/><i>Eleanor Doman, Qi Zhou, Miguel O. Bernabeu, Timm Krüger, Oliver E. Jensen, Igor Chernyavsky</i></p>                             |
| 16:30 | <p>[181] <b>A porous media flow model for simulating flow of non-Newtonian bone cement inside a deformable vertebra in the context of vertebroplasty</b><br/><i>Zubin Trivedi, Dominic Gehweiler, Arndt Wagner, Boyko Gueorguiev-Rüegg, Tim Ricken, Oliver Röhrle</i></p> |
| 16:45 | <p>[559] <b>Multiscale Finite element models with Poromechanics for Myocardial Blood Perfusion</b><br/><i>Sumesh Sasidharan, Jacques Huyghe, Peter Bovendeerd</i></p>   |
-

Oral presentations: Parallel sessions 9, cont.

## MS23: Special Session in honor of Brian Berkowitz

Lecture Hall 2

**Chairs:** *Linda Luquot, Alberto Guadagnini*

- 
- 16:00 [456] **Field-scale Modeling of CO<sub>2</sub> Injection into Highly Reactive Rocks**  
*Tom Postma, Karl Bandilla, Mike Celia*
- 
- 16:15 [392] **Dynamic mesh optimisation for efficient density-driven flow simulations**  
*Meissam Bahlali, Pablo Salinas, Carl Jacquemyn, Matthew D. Jackson*
- 
- 16:30 [419] **Modeling of the Darcy-Brinkman Equation Indicates Possibility of Deterministic Chaotic Behavior for Flow in Fractured-Porous Media**  
*Boris Faybishenko, Jens Birkholzer*
- 
- 16:45 [256] **Structure induced vortices control anomalous dispersion in porous media**  
*Ankur Bordoloi, david scheidweiler, Marco Dentz, Marco Abbarchi, Mohammed Bouabdellaoui, Pietro De Anna*
-

# WEDNESDAY, 01 JUNE 2022

Oral presentations: Parallel sessions 9, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** *Yashar Mehmani, Yongfei Yang, Julien Maes*

Wednesday Detailed Program

- 
- |       |   |
|-------|---|
| 16:00 | [16] <b>GeoChemFoam: an open-source toolbox for pore-scale simulation of complex processes</b><br><i>Julien Maes, Hannah Menke, Sebastian Geiger</i>  |
| 16:15 | [152] <b>Particle-Strength-Exchange methods for Lagrangian 3D DNS of rheological and reactive fluids with evolving interfaces at the pore-scale</b><br><i>Sarah Perez, Philippe Poncet</i>                          |
| 16:30 | [377] <b>How the Probabilistic Nature of the Nucleation Process Affects and Controls the Distribution of Mineral Precipitates in Porous Media</b><br><i>Mohammad Masoudi, Mohammad Nooraiepour, Helge Hellevang</i> |
| 16:45 | [390] <b>Pore scale modeling of the moisture transport in cementitious porous media</b><br><i>Luka Malenica, Zhidong Zhang, Ueli Angst</i>  |
-

Oral presentations: Parallel sessions 9, cont.

## MS13: Fluids in Nanoporous Media

Classroom G1

**Chairs:** *Amin Rezaei, Ahmad Sakhaee Pour*

16:00	[411] <b>Electrochemical Actuation in Nanoporous Silicon</b> <i>manuel Brinker, Patrick Huber</i>
16:15	[563] <b>Molecular Transport in Nanoporous Gold Thin Films for Drug Delivery Applications</b> <i>Erkin Seker</i>
16:30	[384] <b>Operando Determination of Pore-filling Mechanism and Saturation of PEFC Catalyst Layer using Small-Angle X-ray Scattering</b> <i>Kinanti Hantiyana Aliyah, Christian Appel, Christian Prehal, Manuel Guizar-Sicairos, Lorenz Gubler, Jens Eller</i>
16:45	[52] <b>Water transfers (imbibition, drying) in cementitious materials followed by MRI (Magnetic Resonance Imaging)</b> <i>Hicham DIALLA, Alban GOSSARD, Benjamin Maillet, Jean-Baptiste CHAMPENOIS, Philippe Coussot</i>

# WEDNESDAY, 01 JUNE 2022

Oral presentations: Parallel sessions 9, cont.

## MS04: Swelling and shrinking porous media

Classroom G2

**Chairs:** *Sridhar Ranganathan, Nicolaine Agofack*

---

[120] **Modelling pharmaceutical tablet swelling using discrete element modelling and a single particle swelling model**

16:00 *Mithushan Soundaranathan, Mohammed Al-Sharabi, Thomas Sweijen, Pitt Kendal, Axel J. Zeitler, S. Majid Hassanizadeh, Blair Johnston, Daniel Markl*

---

[112] **A shrinking pore network model for drying porous media**

16:15 *Xiang Lu, Abdolreza Kharaghani*

---

[113] **Extraction of pore networks from X-ray images of single wood particles subjected to drying**

16:30 *Chen Jing, Ninghua Zhan, Xiang Lu, Rui Wu, Abdolreza Kharaghani*

---



## SAC Career Development Event Classroom C1 16:00 - 17:00

One of the most common struggles for a PhD student is to decide which career path to follow after graduate school. There are numerous opportunities that are potentially open to us as PhDs, which can take us on very different career paths. There are likely many questions you have about picking a direction (industry/academia/government) and the pros and cons of the various possibilities. A good approach to making an informed decision is listening to experiences and personal views of established professionals. The SAC's career event will have speakers from varied backgrounds, sharing their professional journeys and the important choices they had to make along the way. You will also have the chance to ask the speakers any questions you have!

This event is free and open to all participants of InterPore2022!



**Sarah Gasda**  
NORCE, Norway



**Masa Prodanovic**  
University of Texas,  
USA



**Patrick Jenny**  
ETH Zurich,  
Switzerland



**Vahid Niasar**  
University of  
Manchester, UK

# GALA EVENING

*Wednesday, 17:15 - 22:00*

For the gala affair on Wednesday evening, participants will be treated to a tour of the Sheikh Zayed Grand Mosque, followed by a celebratory dinner at Erth Abu Dhabi. Tickets to this event are included with in-person and accompanying guest registrations.

Dress code for the event is business casual. Due to the heat outside and the cool air conditioning inside, it is advisable to wear short sleeves and bring a light jacket or sweater.

Buses to the mosque and gala dinner will depart Khalifa University at approximately 17:15, directly after Parallel Session 9.



## Visit to the Sheikh Zayed Grand Mosque

The impressive and inspiring Sheikh Zayed Grand Mosque is one of the world's largest mosques and the only one that captures the unique interactions between Islam and other world cultures. Sheikh Zayed bin Sultan Al Nahyan, the Founder of the UAE, had a very specific vision for this mosque: to incorporate architectural styles from different Muslim civilizations and celebrate cultural diversity by creating a haven that is truly welcoming and inspirational in its foundation. The mosque's architects were British, Italian and Emirati, with design ideas borrowed from parts of Turkey, Morocco, Pakistan and Egypt, among other Islamic countries. The end result is a breathtaking, gleaming architectural marvel.

## Gala Dinner

Following the visit to the mosque, participants will be taken just across the way to Erth Abu Dhabi, a beacon of culture, heritage and Emirati hospitality, for a fabulous social occasion.



## Invited Parallel Session

Lecture Hall 1 8:30 - 9:05

**Chair:** Jan Carmeliet

Learn about HOT Microfluidics – Optimising Subsurface Energy Systems! 8:30 - 8:35



**Evangelos Tsotsas 8:35 - 9:05**

Otto von Guericke University Magdeburg

### **Discrete models, continuum models and scale transitions for the drying of porous media**

Continuum models similar to those used for diffusion, heat conduction or viscous flow are since long available for drying processes, so one might think that tabulating respective transport coefficients for various materials should be the main research task left to be fulfilled. However, the opposite is true, because expansion and, especially, deepening of the research on the drying of porous media in the last years has unveiled, how severely restricted common continuum models for drying in reality are. This has mainly been achieved by using pore network simulations as in silico experiments of much superior resolution and accuracy than real experiments can provide to derive continuum model parameters. Tremendous variability, missing uniqueness of such parameters at local scale, and the necessity of corrections by so-called non-local-equilibrium functions are some of the deficiencies diagnosed. They can explain the notorious hardship in identifying the transport parameters of drying porous media, but can also result in serious misunderstanding of the physics behind the drying process. On the other hand, discrete, pore-resolving models are not just the starting point of coarsening, but they can also be used on their own to better understand, which structural features of porous media correlate with their drying behavior, how, and why. Pointing in the direction of reverse engineering towards materials with superior properties, such aspects indicate how ample the potential of research on drying porous media still is.

## Invited Parallel Session (*cont.*)

Lecture Hall 2 8:35 - 9:05

**Chair:** *Michael Celia*



**Ruina Xu** 8:35 - 9:05

Tsinghua University

**Supercritical CO<sub>2</sub> flow and heat/mass transfer in micro/nano-porous structures in CO<sub>2</sub> geological utilization and storage**

CO<sub>2</sub> geological storage and its use to enhance geothermal systems and shale oil/gas recovery are critical technologies for addressing climate change. CO<sub>2</sub> is in a supercritical condition among the above methods.

One of the most important challenges in improving recovery efficiency and long-term storage safety is the migration and heat/mass transfer of supercritical fluids in reservoir porous structures. Under the subsurface conditions, micro/nano-scale confinement, interface effect, and rapid changes in supercritical-fluid physical properties all have a significant influence on transport behavior in the porous structure. This talk will be divided into three parts: (1) heat transfer characteristics of supercritical CO<sub>2</sub> in rocks; (2) CO<sub>2</sub>/CH<sub>4</sub> adsorption in kerogen nano pores; (3) supercritical CO<sub>2</sub>, water, and oil multiphase flow in micro-porous structures.

## Oral presentations: Parallel sessions 10

### MS02: Porous Media for a Green World: Water & Agriculture

Lecture Hall 1

**Chairs:** *Steven Jansen, Jan Vanderborght, Siva Rama Satyam Bandaru*

- 
- |      |   |
|------|---|
| 9:10 | [552] <b>A Novel Mass Transport Model for Direct Contact Membrane Distillation Flux Prediction</b><br><i>Isam Janajreh, <u>Khadije Elkadi</u></i>   |
| 9:25 | [583] <b>Development of Carbon membranes and carbon/CNT membranes for wastewater treatment</b><br><i><u>ILYES JEDIDI</u>, Marc Cretin, Mohamed Saif Al Saidi, Sulaiman Al Isae, Mohamed Mihoub, Mohamed Salah, Baskaran Krishnan, Makki Abdelmouleh</i> |
| 9:40 | [604] <b>A novel technology to remove co-occurring arsenic and atrazine in the groundwater used for drinking</b><br><i><u>Siva Rama Satyam Bandaru</u>, Arkadeep Kumar, Mohit Nahata, Dana Hernandez, Ashok Gadgil</i>                                  |
| 9:55 | [603] <b>Fenton Reaction in Porous Media</b><br><i><u>Ambika Selvaraj</u></i>   |
-

# THURSDAY, 02 JUNE 2022

Oral presentations: Parallel sessions, 10 cont.

## MS23: Special Session in honor of Brian Berkowitz

Lecture Hall 2

**Chairs:** *Leonardo Donado, Boris Lora Ariza*

- 
- 9:10 [459] **From streamlines to discrete fracture modelling of multi-phase flow and deformation in fractured porous media**  
*Rainer Helmig, Bernd Flemisch, Holger Class, Dennis Glaeser*
- 
- 9:25 [240] **Characterising flow and transport in fractured geological media: 20 years later**  
*Sebastian Geiger*
- 
- 9:40 [355] **Global sensitivity analysis on a groundwater flow model in a regional- scale with uncertain parameters: a case study in the Middle Magdalena Valley- Colombia.**  
*Boris Lora Ariza, Luis Silva Vargas, Eduardo Castro Alcalá, Leonardo Donado Garzón*
- 
- 9:55 [376] **Structure and stochastic dynamics of hydrodynamic flow and transport in three-dimensional random fracture networks**  
*Jeffrey Hyman, Marco Dentz*
-

Oral presentations: Parallel sessions 10, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** *Bo Guo, Ke Xu, Julien Maes*

---

9:10 [303] **Variation of the representative elementary volume (REV) in heterogeneous rocks with changing CT image resolution**  
*Marcel Reinhardt, Saeid Sadeghnejad, Frieder Enzmann, Michael Kersten*

---

9:25 [288] **Copper leaching in low-grade ore: A reactive-transport modelling study revealing controls on local reactions on mineral surfaces**  
*Ralf Haese, Eric Ansah, Black Jay R., Apoorv Jyoti*

---

9:40 [521] **A new Pore Network stochastic generation approach utilising bulk pore characterisation data with application to mudrocks**  
*Georgy Borisochev, Andreas Busch, Jingsheng Ma, Lin Ma*

---

9:55 [259] **An improved network extraction algorithm by tracking size variation of throats**  
*Yang Liu, Wenbo Gong, Moran Wang*

---

Oral presentations: Parallel sessions, 10 cont.

## MS13: Fluids in Nanoporous Media

Classroom G1

**Chairs:** *Hicham Dialla, Amin Rezaei, Erkin Seker*

---

9:10 [465] **Water confined in salt crusts: insights from molecular simulations**  
*Simon Gravelle, Sabina Haber-Pohlmeier, Alexander Schlaich, Christian Holm*

---

9:25 [93] **Gas Flow Simulation in Multiscale and Multimineral Digital Rocks of Shale Samples**  
*Yuqi Wu, Keyu Liu, Chengyan Lin*

---

9:40 [510] **Pore networks meet computational chemistry: a hybrid approach for studying the flow of fluid mixtures under various thermodynamic conditions in nanoporous materials.**  
*Aleksey Khlyupin, Irina Nesterova, Rustem Sirazov, Kirill Gerke*

---

9:55 [229] **Effect of osmosis on spontaneous imbibition of fracturing fluid in shale oil formation**  
*Qinghao Sun, Wendong Wang, Xincheng Guo, Yuliang Su, Jilong Xu, Guanqun Li, Hao Sun*

---

Oral presentations: Parallel sessions 10, cont.

## MS15: Machine Learning and Big Data in Porous Media

Classroom G2

**Chairs:** *Bicheng Yan, Bailian Chen, Hongkyu Yoon*

---

9:10 [555] **Machine Learning for Porosity and Absolute Permeability Prediction from Carbonate Rock Images**  
*Ramanzani Kalule, Hamid Abderrahmane, Waleed Alameri, Mohamed Sassi*

---

9:25 302] **Morphology Decoder: Untangling Heterogeneous Porous Media Texture and Quantifying Permeability and Capillary Pressure by Semantic Segmentation**  
*Omar Al-Farisi, Atkifa Raza, Mohamed Sassi, Djamel Ouzzane, Mohamed Abdelsalam, Salem Alzaabi, TieJun Zhang*

---

9:40 [389] **Twisting the ensemble Kalman filter with random forest**  
*J. Jaime Gómez-Hernández, VANESSA A. GODOY, Gian Napa*

---

9:55 [354] **Semantic segmentation of rock images and ensemble approach for deep learning methods**  
*Robert John Ringer, Hongkyu Yoon*

---

# THURSDAY, 02 JUNE 2022

Oral presentations: Parallel sessions, 10 cont.

## MS04: Swelling and shrinking porous media

Classroom C1

**Chairs:** *Nicolaine Agofack, Jean-Francois Louf*

---

9:10 [182] **Multidirectional gel swelling and drying: a linear-elastic-nonlinear-swelling theory for hydrogels**  
*Joseph Webber, Grae Worster, Merlin Aragon Etzold*

---

9:25 [349] **Stress and Relax: Hydrogel swelling in a confined granular medium and relaxing after extraction**  
*Jean-Francois Louf, Nancy Lu, Margaret O'Connell, H. Jeremy Cho, Sujit Datta*

---

9:40 [41] **The swelling and shrinking of a thermo-responsive hydrogel**  
*Matthew Butler, Tom Montenegro-Johnson*

---

9:55 [206]  **$\mu$ CT investigation of liquefaction mechanisms at the pore scale**  
*Nicolaine Agofack, Haili Long-Sanouiller, Pierre Cerasi*

---



## Poster Exhibition: Session 7 Exhibition Area 10:10 - 11:20

### *Nanoporous Media*

[375] **Dynamic pore-network modeling of compositional flow and nanoconfined phase behavior in shale rocks**

*Sidian Chen, Jiamin Jiang, Bo Guo*

### *Porescale systems and microfluidics*

[131] **INFLUENCE OF SiO<sub>2</sub> NANOFUID ON ENHANCED OIL RECOVERY INSIDE A TRANSPARENT MICROPOROUS MEDIA**

*Afshin Goharzadeh, Yit Fatt Yap*

[158] **Effect of grain size and distribution on the two-phase flow at pore scale**

*Yin Chen, Jianchao Cai, Yang Liu, Jiuyu Zhao, Yadan Ma*

[161] **Study on the dominant factors of rock permeability**

*Kai Xu, Jianchao Cai, Chenhao Sun, Juncheng Qiao, Xiangjie Qin, Jiuyu Zhao*

[166] **A fast hybrid method of reconstructing 3D digital rock**

*Weichao Yan, Huilin Xing, Likai Cui, Ping Feng*

[180] **Improved micro-continuum approach for pore scale simulation of capillary dominated flow with lower spurious velocities**

*Zhiying Liu, Qianghui Xu, Junyu Yang, Lin Shi*

[195] **Novel Fabrication of Microfluidic Devices with Mixed Wettability**

*Abdullah AlOmier, Antonia Sugar, Dongkyu Cha, Subhash C. Ayirala, Hussein Hoteit*

[588] **Polymeric Membranes' Morphology and Water Flow Simulation**

*Meixia Shi*

[614] **Dependence of hydraulic conductivity on effective confining pressure in rocks and concretes**

*Kotone Sakemoto, Masaji Kato, Yusuke Ishii, Kiyofumi Kurumisawa, Yoshitaka Nara*

Poster Exhibition: Session 7, cont.  
Exhibition Area 10:10 - 11:20

## *Porous media, environment and biology*

[327] **Microplastics Effects on Evaporation Dynamics and Cracking Morphology in Drying Porous Media**

*Sahar Jannesarahmadi, Nima Shokri*

[409] **Geochemical studies of CO<sub>2</sub>-Brine-Rock interaction at surface and subsurface conditions during geological storage of carbon dioxide**

*Jude Edigwe, Mardin Abdalqadir, Sina Rezaei-Gomari*

[449] **Investigation of different clay activation techniques to capture and store carbon dioxide (CO<sub>2</sub>)**

*Cindy Chomba, Mardin Abdalqadir, Sina Rezaei-Gomari*

## *Multi-scale, multi-physics and non-linear effects in porous media*

[203] **Analytical and numerical studies of Feynman diagram technique and Dyson equation for random nonhomogeneous multi-phase media**

*Alexey Sboyshakov, Andrey Pupasov-Maksimov*

[346] **MODELLING OF FREEZING AND THAWING EXPERIMENTS OF SATURATED SAND COLUMN**

*Martina Sobotkova, Alexandr Zak, Michal Snehota, Michal Benes*

[620] **Predicting thermal potential of a shallow ground to support design of low-temperature district heating and cooling networks**

*Shakil Masum, Wu Gao, Hywel Thomas*

## Oral presentations: Parallel sessions, 11

### MS23: Special Session in honor of Brian Berkowitz

Lecture Hall 2

**Chairs:** Yaniv Edery, Alberto Guadagnini

---

11:20 [207] **Impact of nano-porous coatings on rates of coupled dissolution-precipitation reactions**  
*Simon Emmanuel*

---

11:35 [25] **Impact of hydro-chemical conditions on structural and hydro-mechanical properties of chalk samples during dissolution experiments**  
*Delphine Roubinet, Linda Luquot, Marie Leger*

---

11:50 [216] **Bifurcating-Paths: the relation between preferential flow bifurcations, void, and tortuosity on the Darcy scale.**  
*yaniv edery, Dagan Avioz*

---



# THURSDAY, 02 JUNE 2022

Oral presentations: Parallel sessions 11, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** *Ke Xu, Yongfei Yang, Stéphane Zaleski, Julien Maes*

---

11:20 [324] **Mobilization erases bubbles' hysteresis in porous media**  
*Chuanxi Wang, Ke Xu*

---

11:35 [290] **A pore-scale level-set approach to Ostwald ripening of gas bubbles in porous media in the presence of residual oil and water**  
*Deepak Singh, Helmer Andre Friis, Espen Jettestuen, Johan Olav Helland*

---

11:50 [475] **Investigating compressible gas flow through porous media considering the choked condition and shockwave formation for Pulse-Pressure Decay test: A Computational Fluid Dynamics (CFD) approach**  
*Ali Nabizadeh, Jingsheng Ma, Steven McDougall*

---

12:05 [174] **A Geometry-based Throat Shape Correction of Pore Network Models**  
*Benjamin Kellers, Martin Lautenschläger, Julius Weinmiller, Timo Danner, Arnulf Latz*

---

Oral presentations: Parallel sessions, 11 cont.

## MS07: Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Classroom G1

**Chairs:** *Michel Kern, Shuyu Sun*

- 
- 11:20 [232] **Numerical Analysis of a Mixed Finite Element Approximation a Model of Biofilm Growth in Porous Media**  
*Azhar Alhammali, Malgorzata Peszynska, Choah Shin*
- 
- 11:35 [295] **Differentiation in biological porous media: a role for diffusiophoresis and surface instabilities**  
*Jacques Huyghe*
- 
- 11:50 [316] **A One-domain approach for flow near porous media boundaries**  
*Francisco J. Valdés-Parada, Didier Lasseux*
- 
- 12:05 [548] **Linear lignin as a potential consolidant for archaeological wood treatment: a hybrid Monte Carlo and molecular dynamics study**  
*Ali Shomali, chi zhang, Wenqiang Liu, Benoit Coasne, Eleanor J. Schofield, Dominique Derome, Jan Carmeliet*
-

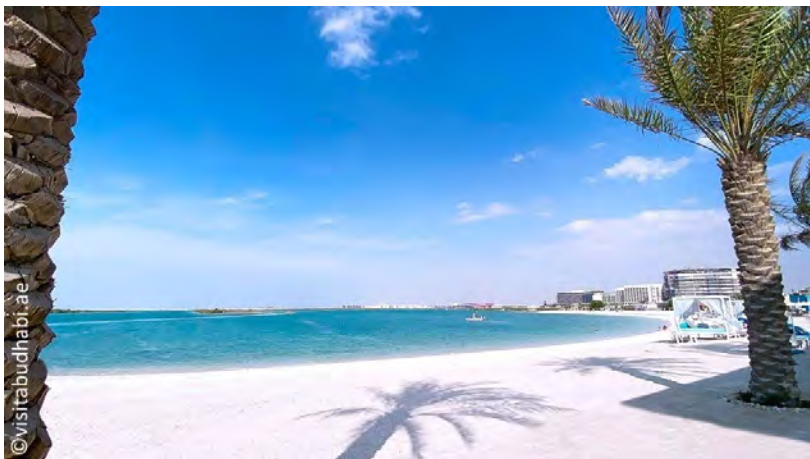
Oral presentations: Parallel sessions 11, cont.

## MS15: Machine Learning and Big Data in Porous Media

Classroom G2

**Chairs:** Bicheng Yan, Jianchun Xu, Hongkyu Yoon

- 
- 11:20 [422] **Digital twin of a laboratory-scale porous medium**  
*Benyamine Benali, Jakub Both, Martin Ferno, Eivind Fond, Kjetil Johanessen, Eirik Keilegavlen, Trond Kvamsdal, Jan Martin Nordbotten, Adil Rasheed*
- 
- 11:35 [99] **Multi-scale reconstruction of porous media from low-resolution core images using conditional generative adversarial networks**  
*Yongfei Yang, Fugui Liu, Jun Yao*
- 
- 11:50 [317] **Blank filling, sedimentary fabric identification and reservoir property calculation based on image logs**  
*Keran Li, Shan Ren, Jinmin Song, Xin Jin, Jiaxin Ren, Lingli Zhao, Yuxiang Feng, Lizhou Tian, Wei Chen, Shun Xia*
- 
- 12:05 [397] **Stylolite detection and image classification from whole core images using convolutional neural networks**  
*Ali Hassanloo, Saeid Sadeghnejad, Meysam Nourani, Mansour Rezghi*
- 



Oral presentations: Parallel sessions, 11 cont.

## MS03: Flow, transport and mechanics in fractured porous media

Classroom C1

**Chairs:** *Hamid Nick, Ariadni Elmaloglou, Olav Møyner*

---

11:20 [163] **Fractal characterization of time-dependent shape factor for counter-current imbibition in fractured reservoirs**  
*Lan Mei, Jianchao Cai, Qingbang Meng, Yin Chen*

---

11:35 [212] **Efficient Solvers based on Hybrid High Order (HHO) methods for flow simulations in fractured rocks.**  
*Alexandre Ern, Florent Hédin, Géraldine Pichot, Nicolas Pignet*

---

11:50 [374] **Adaptive Conservative Time Integration with Higher Order Schemes for Transport in Fractured Porous Media**  
*Michael Liem, Patrick Jenny, Stephan Matthai*

---

## Oral presentations: Parallel sessions 12

### MS01: Porous Media for a Green World: Energy & Climate

Lecture Hall 1

**Chairs:** *William Rossen, Maartje Boon*

- 
- 13:30 [132] **Minimal surfaces in gas diffusion layers**  
*Mohammad Javad Shojaei, Branko Bijeljic, Martin Blunt*
- 
- 13:45 [199] **Impact of compression on the properties of the fuel cell diffusion layer**  
*Asma SHARIF, Manuel MARCOUX, Marc Prat*
- 
- 14:00 [553] **Direct pore-level multiphysical model for solar thermochemical fuel production reactor based on structured porous media**  
*Da Xu, Meng Lin*
- 
- 14:15 [361] **Porous ceria foams coated with Ca-doped lanthanum manganite perovskites for solar thermochemical CO<sub>2</sub>/H<sub>2</sub>O splitting**  
*Amir Masoud Parvanian, Ehsan Baniasadi*
- 
- 14:30 [574] **Impact of Relative Humidity on the Adsorption of Volatile Organic Compounds by Industrial Porous Materials**  
*Meishan Guo, Majid Naderi, Manaswini Acharya, Damiano Cattaneo, Daryl Williams*
- 
- 14:45 [44] **Capillary-number Insights into Mobilization of Oil in Porous Media by Foam Injection**  
*Jinyu Tang, William Rossen*
- 
- 15:00 [331] **The Role of Gas Composition on Injectivity in Surfactant-Alternating-Gas Foam Processes**  
*JIAKUN GONG, William Rossen*
-



Oral presentations: Parallel sessions, 12 cont.

## MS06-A: Physics of multiphase flow in diverse porous media

Lecture Hall 2

**Chairs:** *Ying Gao, Humera Ansari*

- 
- 13:30 [82] **Direct prediction of fluid-fluid displacement efficiency in ordered porous media using the pore structure**  
*Tian Lan, Ran Hu, Wei Guo, Guanju Wei, Yi-Feng Chen, Chuang-Bing Zhou*
- 
- 13:45 [89] **Sol-gel transition in porous media by drying**  
*Romane Le Dizès, Leo Pel, Sara Jabbari Farouji, Noushine Shahidzadeh*
- 
- 14:00 [135] **Surface-Active Compounds Induced Time-Dependency and Non-Monotonicity in Fluid-Fluid Displacement in Porous Media**  
*YUJING DU, Ke Xu, Lucas Mejia, Matthew Balhoff*
- 
- 14:15 [151] **A mathematical model of oil-water spontaneous imbibition with dynamic contact angle in the fractal porous media of tight reservoirs**  
*Yongfei Yang, Lixin Kang, Lei Zhang, Jun Yao*
- 
- 14:30 [291] **Wettability effect on Pore-filling events during two-phase flow**  
*LIFEI YAN, Bernhard Weigand, Amir Raoof, Johannes Müller*
- 
- 14:45 [293] **The Transition from Connected to Disconnected Pathway Flow Regime : Understanding the Combined Effects of Wettability and Flowrate**  
*Rumbidzai Nhunduru, Amir Jahanbakhsh, Krystian. L Wlodarczyk, M. Mercedes Maroto-Valer, Omid Shahrokhi, Susana Garcia*
- 
- 15:00 [520] **Ion composition effect on spontaneous imbibition in limestone cores.**  
*Raymond Mushabe, Gbadebo Adejumo, Azizov Ilgar, Carl Fredrik Berg, Antje van der Net*
-

# THURSDAY, 02 JUNE 2022

Oral presentations: Parallel sessions 12, cont.

## MS09: Pore-scale modelling

G Auditorium

**Chairs:** *Ke Xu, Yongfei Yang, Stéphane Zaleski, Julien Maes*

- 
- 13:30 [227] **Absolute permeability of glass bead packs: the first principles agreement between experiment and pore-scale simulations**  
*Siarhei Khirevich, Maxim Yutkin, TADEUSZ PATZEK*
- 
- 13:45 [139] **Relative permeability computations using large Digital Rock Physics simulations**  
*Mohamed Regaieg, Igor Bondino, Clément Varloteaux, Tityl Farhana Faisal, Richard Rivenq*
- 
- 14:00 [547] **Predictive multi-scale network models with micro-porosity**  
*Sajjad Foroughi, Branko Bijeljic, Martin Blunt*
- 
- 14:15 [446] **Comparison of the Generalized Network Model to Direct Numerical Simulation for Two-Phase Flow**  
*Luke Giudici, Ali Qaseminejad Raeini, Takashi Akai, Martin Blunt, Branko Bijeljic*
- 
- 14:30 [433] **Analysis of Stokes-Brinkman modeling for solute/particle transport in a domain with microporous regions**  
*Bin Wang, Karsten Thompson, Richard Hughes*
- 
- 14:45 [21] **Digital Rock Characterization of Glacial Deposits to Refine Pore Systems**  
*Ivan Deshenenkov, Paul Tarabbia, Aqeel Khalifa*
- 
- 15:00 [323] **Pore network simulation of salt subflorescence growth in a porous medium**  
*oumayma fekih, Marc Prat, nour sghaier*
-

Oral presentations: Parallel sessions, 12 cont.

## MS07: Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

Classroom G1

**Chairs:** *Jakub Both, Shuyu Sun*

- 
- 13:30 [65] **An efficient preconditioning framework for the coupled simulation of contact mechanics with hydraulically active fractures**  
*Laura Gazzola, Andrea Franceschini, Massimiliano Ferronato*
- 
- 13:45 [128] **Simulation of interface-coupled porous-medium applications using partitioned coupling methods**  
*Alexander Jaust, Miriam Schulte*
- 
- 14:00 [242] **Coupled flow in porous media with thin inclusions: preconditioning based on rational approximations of the fractional interface operators**  
*Svetozar Margenov, Stanislav Harizanov, Ivan Lirkov*
- 
- 14:15 [498] **Solvers for Coupled PDE Problems in Porous Media Science**  
*Arne Naegel*
- 
- 14:30 [564] **Coupled Thermo-Hydro-Mechanical-Chemical Analysis of CO<sub>2</sub> Injection in a North Sea Chalk Reservoir**  
*Seyedbehzad Hosseinzadeh, Frédéric Amour, Mohammad Reza Hajiabadi, Hamid M. Nick*
- 
- 14:45 [201] **Numerical modelling the hydromechanical behavior of undrained triaxial tests on saturated concrete**  
*Jinzhou Bai, Hanbing Bian, Yun Jia, Jean-Philippe Carlier*
- 
- 15:00 [550] **Numerical investigation of the flow and phase transitions of CO<sub>2</sub> near its triple-point during a blowout from a plugged well**  
*Pramod Bhuvankar, Abdullah Cihan, Jens Birkholzer*
-

# THURSDAY, 02 JUNE 2022

Oral presentations: Parallel sessions 12, cont.

## MS15: Machine Learning and Big Data in Porous Media

Classroom G2

**Chairs:** *Bicheng Yan, Teeratorn Kadeethum, Hongkyu Yoon*

- 
- 13:30 [279] **The Method Of Solving incompressible Two-phase Seepage Equation In Porous Media By Deep Neural Networks**  
*JiangXia Han, Liang Xue*
- 
- 13:45 [205] **Image-based physics-constraint workflow for multi-phase flow simulation in heterogeneous media**  
*Jingyan Zhang, Bicheng Yan, Yuhe Wang*
- 
- 14:00 [404] **Machine learning to accelerate nonlinear solvers applied to multiphase porous media flow**  
*Vinicius Santos Silva, Pablo Salinas, Matthew D. Jackson, Christopher C. Pain*
- 
- 14:15 [353] **Multiscale modelling of permeability and effective dispersion coefficient in porous media: a deep learning approach**  
*Agnese Marcato, Gianluca Boccardo, Daniele Marchisio, Matteo Icardi, Javier E. Santos, Masa Prodanovic*
- 
- 14:30 [470] **Improving the Performance of Reactive Transport Simulations using Artificial Neural Networks**  
*Ersan Demirer, Emilie Coene, Aitor Iraola Galarza, Albert Nardi, Elena Abarca, Andrés Idiart, Giorgio de Paola, Noelia Rodríguez-Morillas*
- 
- 14:45 [214] **Upscaling investigations of dissolution using machine learning and GeoChemFoam**  
*Hannah Menke, Sebastian Geiger, Julien Maes*
- 
- 15:00 [486] **A Full Order, Reduced Order and Machine Learning Model Pipeline for Efficient Prediction of Reactive Flows**  
*Oleg Iliev*
-

Oral presentations: Parallel sessions, 12 cont.

## MS03: Flow, transport and mechanics in fractured porous media

Classroom C1

**Chairs:** *Hamid Nick, Ariadni Elmaloglou, Holger Steeb*

- 
- 13:30 [98] **Simulation of CO<sub>2</sub> mineral trapping and permeability alteration in fractured basalt: Implications for geologic carbon sequestration in mafic reservoirs**  
*Hao Wu, Richard Jayne, Robert Bodnar, Ryan Pollyea*
- 
- 13:45 [235] **Governing Forces in Fractured Reservoirs: A Data-Driven Sensitivity Analysis**  
*Xupeng He, Marwah AlSinan, Hyung Kwak, Hussein Hoteit*
- 
- 14:00 [277] **Impacts of fractures on hydrodynamic trapping for CO<sub>2</sub> storage in deep saline aquifers**  
*Yuhang Wang, Cornelis Vuik, Hadi Hajibeygi*
- 
- 14:15 [328] **Miscible displacement in near-fracture porous media with non-Fickian Diffusion**  
*Fei Yu, Yandong Zhang, Ke Xu*
- 
- 14:30 [351] **Physics-driven interface modeling of multiphase flow in different scale of subsurface fractures**  
*wenhui song, Masa Prodanovic, Jun Yao, Kai Zhang*
- 
- 14:45 [386] **A Particle-Tracking Scheme with Adaptive Diffusion for Multiphase Flows in Fractured Porous Media**  
*Ranit Monga, Daniel Meyer, Patrick Jenny*
- 
- 15:00 [417] **Multiphysics of Fractured Reservoirs in a Unified Modeling Environment**  
*Nancy Bannach, Ed Gonzalez, Tycho van Noorden, Sonja Weinbrecht*
-

## Poster Exhibition: Session 8 Exhibition Area 10:10 - 11:20

### Nanoporous Media

[200] **Film-to-pore filling transition during water adsorption in nanoporous media**

*Abdullah Cihan, Tetsu Tokunaga, Jens Birkholzer*

[516] **Molecular dynamics of a fluid confined in kerogen from memory kernels**

*Kristina Ariskina, Guillaume Galliero, Amael Obliger*

### Porescale systems and microfluidics

[222] **Production and characterization of porous sludge-derived biochar as a sustainable solution for the water industry**

*Andre Frota, Naiara Oliveira, Mona Lisa Oliveira, Thiago Xavier, Erdin Ibrahim, Odair Ferreira, José Capelo Neto, Tannaz Pak*

[283] **Insights into the Effects of Wettability Heterogeneity on Fluid Flow at Pore-Scale**

*Amir Jahanbakhsh, Omid Shahrokhi, M. Mercedes Maroto-Valer*

[296] **Pore-scale modelling of polymeric solutions in porous media**

*Amna Al-Qenae, Rouhi Farajzadeh, Vahid Niasar*

[340] **Extended Allen-Chan phase-field equation for ternary fluid flows and phase-change process in binary fluid flows**

*Reza Haghanihasanabadi, Carl Fredrik Berg, eirik flekkøy*

[345] **Comparison of Pore-network Simulation and Infiltration Experiment Performed on Coarse Sand**

*Tomas Princ, Michal Snehota*

[400] **Local wettability characterization of porous media under two-phase conditions using lattice-Boltzmann simulations**

*Hamidreza Erfani Gahrooei, Reza Haghanihasanabadi, Per Arne Slotte, James McClure, Carl Fredrik Berg*

[425] **Modeling digital twins of grain-based reservoir rocks**

*Arne Jacob, Christian Hinz, Jens-Oliver Schwarz, Andreas Wiegmann*

## Poster Exhibition: Session 8, cont. Exhibition Area 10:10 - 11:20

### *Porescale systems and microfluidics, cont.*

[508] **Effects of compaction on pore structure and soil hydraulic properties**  
*Soheil Safari Anarkouli, Martin Lanzendörfer*

### *Porous media, environment and biology*

[58] **Agrochemical Transport in Heterogeneous Agricultural Soils**  
*Mackenzie Dughi, Veronica Morales*

[80] **Microfluidic model of micro-haemodynamics in porous media**  
*Qi Chen, Naval Singh, Kerstin Schirrmann, Igor Chernyavsky, Anne Juel*

[219] **Development of a salt-impregnated SAPO-34 porous matrix with graphene oxide for water sorption applications**  
*Samar Nasr, Ludovic Dumeé, Yasser Al Wahedi, Ali Al Alili, Georgios Karanikolos*

[506] **Salt precipitation and its impact on rock porosity – An X-ray micro-tomography study**  
*Pavel Kazakovtsev, Nathaly Lopes Archilha, Nima Shokri, Tannaz Pak*

[536] **Chemotaxis promoted bacterial transport toward residual NAPL in a dual-permeability microfluidic device**  
*Beibei Gao, Roseanne Ford, Xiaopu Wang*

### *Multi-scale, multi-physics and non-linear effects in porous media*

[357] **Three-dimensional fractal model of hydraulically fractured horizontal wells in anisotropic naturally fractured reservoirs**  
*Rosa María Mariscal Romero, Rodolfo Gabriel Camacho Velázquez*

[505] **Estimating the structure of a spatially layered media from the radial flow experiments with shear-thinning fluids**  
*Martin Lanzendörfer, Mls Jiří*

[609] **Numerical modelling of CO<sub>2</sub> sequestration in coal-seams based on a parallel hybrid discrete fracture – dual porosity model**  
*Shakil Masum, Min Chen, Hywel Thomas*

# THURSDAY, 02 JUNE 2022

## Plenary Session

Main Auditorium 16:25 - 17:30

**Chair:** *Mohamed Sassi*

## Award Ceremony 16:25 - 16:40



### **InterPore PoreLab Award for Young Researchers**

Senyou An

*Imperial College London, UK*

This award is given to a young researcher in recognition of outstanding contributions in the field of porous media from a fundamental point of view. The research may be theoretical, computational, or experimental.

**A word of gratitude:** This award has been made possible by a generous grant from PoreLab (a research center of excellence jointly formed by Norwegian University of Science and Technology (NTNU) in Trondheim and the University of Oslo (UiO). PoreLab focuses on the physics of porous media using experimental, theoretical and computational





**Rien van Genuchten Early-Career Award of Porous Media for a Green World**

Siva Rama Satyam Bandaru  
*University of California, Berkeley, USA*

The Rien van Genuchten Early Career Award is given to an early-career researcher whose focus is the general topic of “porous media research for a green world”. This may involve significant theoretical, experimental and/or modeling advances addressing major soil, hydrologic and/or environmental problems facing our planet.

**A word of gratitude:** This award has been made possible by a generous donation from Dr. Betty-May Pontedeiro to the InterPore Foundation and is created in honor of the eminent soil and groundwater scientist Marthinus (Rien) Th. van Genuchten. Rien van Genuchten is world renown for his enormous achievements in the area of fluids flow and solutes transport in partially-saturated porous media. He has made highly impactful contributions to the understanding and modeling of subsurface processes, in such widely varying fields as soil physics, hydrology, geology, the environmental sciences, and civil engineering.

**InterPore National Chapter Awards**



The National Chapter Awards are given in recognition of remarkable activities over the past year.

**Visit the National Chapters booth in the virtual exhibition hall to learn more about joining or starting a National Chapter**

# THURSDAY, 02 JUNE 2022

## Plenary Session, cont.

Main Auditorium 16:25 - 17:30

**Chair:** *Mohamed Sassi*

## Plenary Lecture 16:25 - 17:05



**Abraham Stroock**

Cornell University

### **The Pulse of Plants**

Plants give life to our planet by pulling critical reagents out of the soil from below (water and micronutrients) and out of the atmosphere from above (light and carbon dioxide). To achieve this feat, they master a wide range of fluid mechanical contexts, from flows in unsaturated porous media around their roots, through nanoconfined flows in their tissues, to turbulent air flows around their leaves. They regulate these steps in the transpiration process passively through their internal and external structure and actively through valves (stomates) that control the coupling to the atmosphere. Through each day, the flux and stress within a plant pulse due to physical and biological responses to fluctuations in sunlight, wind, temperature, and humidity in the microenvironment. This pulse of plants defines their productivity and efficiency in both natural and agricultural contexts. In this talk, I will describe our work measuring these dynamics with a microfluidic sensor that itself borrows design principles from the vascular structure of plants. I will use our efforts to model the observed dynamics to illustrate the coupling of the various flows mentioned above with the physiology of plants. I will also point toward implications for improved understanding of the biology and increased efficiency in the management of water in agriculture.

## Closing Ceremony

Main Auditorium 17:20 - 17:30

### **MDPI Energies Student Poster Awards**

The MDPI Energies Student Poster Award is given in recognition of outstanding student poster presentations at the annual InterPore conference. Each year, at the annual InterPore conference, the Honors and Awards Committee will choose the best student poster presentations to win the MDPI Energies Student Poster Award.

**A word of gratitude:** This award has been made possible by a generous grant from MDPI Energies.

### **InterPore Rosettes**

InterPore activities are carried out mainly by volunteers. It takes many voluntary working hours to make an international platform like InterPore a success. Recognizing and honoring volunteers sets a standard for service, encourages a sustained commitment to participation, and inspires others to commit themselves as well.

Each year, InterPore honors selected individuals who have made very significant contributions to InterPore activities; they receive the InterPore Rosette.



# InterPore2023

15th International Conference  
on Porous Media

22 - 25 May 2023

Edinburgh, Scotland



The **scientific program** ranges from **pore-scale modeling, pore-scale imaging, to experimental and numerical methods on larger scales, to sensitivity and uncertainty analysis**. Stay abreast of the latest porous media research on trending topics such as **energy storage, biotechnics and nature-based agriculture**. Presentations will be given on a wide variety of porous media processes in highly diverse applications, including: **transport phenomena, soil mechanics, fuel cells, filters, foams, membranes and more**. InterPore2023 also offers opportunities to find collaborative **industrial and application-oriented institutional partners**.

## Topics and Applications

- Mass and heat transport
- Multiphysics-multiphase flow
- Reservoir engineering, CO<sub>2</sub> sequestration, geothermal energy and energy storage
- Colloids and nanoparticle transport
- Soil mechanics and engineering
- Swelling porous media
- Wave propagation
- Biotechnology and biofilms
- Thin and nanoscale poromechanics
- Fuel cells and batteries
- Food, wood, composites
- Fibers and textiles
- Filters, foams, membranes, papers
- Ceramics and construction materials

## Venue and city

The 15th Annual InterPore Meeting will be held at the Edinburgh International Conference Centre (EICC) in the heart of Edinburgh, Scotland. Home to three UNESCO Heritage Sites, four Universities and named the UK's "Greenest City", Edinburgh is full of history, culture and places waiting to be explored.

EICC's state-of-the-art facilities include adaptable auditoria, break-out suites and spacious exhibition and reception areas all complemented by the latest technologies. The EICC is easily accessible by public transportation and is only 10km away from Edinburgh International Airport, which offers over 300 flights a day to more than 130 UK and worldwide destinations.

## Program Committee

**Chair:** Patrick Jenny - *ETH Zürich*

**Vice-Chair:** Sridhar Raganathan - *Kimberly Clark*

## Local Organizing Committee

School of Energy, Geoscience, Infrastructure and Society  
Heriot Watt University

**Co-Chairs:** Andreas Busch, Florian Doster



[www.interpore.org/2023](http://www.interpore.org/2023)