

Flowing Matter in Porous Media

CECAM Flagship Workshop, Freie Universität Berlin (24–27 February, 2025)

Organisers: Felix Höfling, Jürgen Horbach, Liesbeth Janssen, Anna Maciolek

Mon 13:50 – 15:20 Nanofluidic Flows

- Opening (10')
- **Roland Pellenq** (CNRS, Univ. Montpellier)
Molecular flow in a nano-silo
- Mathieu Lizée (FHI Berlin), L. Bocquet (CNRS, ENS Lyon)
Nanofluidics with supercooled liquids yields the first hints of phononic liquid friction
- Giorgia Marcelli, F. Höfling (FU Berlin)
Fluid flow inside nanopores with atomically rough surfaces

Discussions & Coffee

Mon 16:20 – 18:00 Density Functional Theory in a State of Flux

- **Poster Flash Talks** (2' each)
- **Matthias Schmidt** (Univ. Bayreuth)
Neural functionals and unexpected symmetries in statistical mechanics
- Jacobus Dijkman, M. Dijkstra, R. van Roij, J.-W. Van de Meent, B. Ensing, M. Welling (Univ. Amsterdam)
Learning neural free energy functionals with pair-correlation matching
- **Poster Flash Talks** (2' each)

Mon 18:30 – 20:30 Posters and Reception

Tue 9:00 – 10:00 Active Flows under Confinement

- **Subir K. Das** (JNCASR Bangalore)
Structure and dynamics in constrained flows of aligning active particles
- **Marisol Ripoll, J. Mecke** (FZ Jülich)
Chiral active systems in patterned environments

Discussions & Coffee

Tue 11:00 – 12:20 Microscopic Theory of Confined Liquids

- **Thomas Franosch** (Univ. Innsbruck)
Structural relaxation in confined colloidal liquids within mode-coupling theory
- **Vincent Krakoviack** (ENS Lyon)
Equilibrium and driven dynamics of fluids in random potential energy landscapes: Mode-coupling theory and beyond

Lunch Break & Discussions

Tue 14:00 – 15:20 Self-Assembly under Flow

- **Anna Balazs** (Univ. Pittsburgh)
Tailoring convective flows to autonomously assemble hierarchical 3D structures
- **Eleonora Secchi** (ETH Zurich) — Emerging Topic Lecture
The role of fluid dynamics in driving biofilm formation, rheology, and clogging dynamics

Discussions & Coffee

Tue 16:40 – 17:40 Unstable Flows in Microfluidics

- **Camille Jorge, D. Bartolo** (ENS Lyon)
Active hydraulics
- **Sujit S. Datta** (CalTech, Pasadena) — online
Chaos in confinement: Harnessing viscoelasticity to mix fluids in porous media at low Reynolds number

Wed 9:00 – 10:20 Multi-Phase Flows and Mixtures

- **Alex Hansen** (NTNU Trondheim)
Statistical mechanics of immiscible two-phase flow in porous media
- **Özgür Yazaydın** (University College London)
Concentration gradient driven molecular dynamics

Discussions & Coffee

Wed 11:20 – 12:20 Motion in Arrested Matter

- **Pinaki Chaudhuri** (IMSc Chennai)
Flow within a dense binary mixture having large size dispersity
- Corentin Laudicina, I. Pihlajamaa, L. M. C. Janssen (TU Eindhoven)
Echoes of partial localisation in polydisperse supercooled liquids

Lunch Break & Discussions

Wed 14:00 – 15:00 Active Colloidal Flows

- **Thomas Voigtmann** (DLR Cologne)
Motion of active particles in glassy suspensions
- Arthur V. Straube (Zuse Institute Berlin), F. Höfling (FU Berlin)
Depinning transition of self-propelled particles

Discussions & Coffee

Wed 16:20 – 17:20 Tortuous Flows in Random Media

- Dmitry Lapshin, E. A. Müller (Heriot-Watt Univ. Edinburgh)
The behavior of hydrocarbon liquids confined in kerogen networks
- Mirko Residori, C. Kurzthaler, S. Mandal, A. Voigt (MPI-PKS Dresden)
Stokes flow through porous media at the percolation transition
- Craig Singiser, S. Datta (Princeton Univ.)
Unraveling the dynamics of polymer scission in porous media

Wed 19:30 – 22:00 Social Dinner

Thu 9:20 – 10:20 Confined Colloidal Flows

- **Alice Thorneywork** (Univ. Oxford)
Interpreting transport fluctuations in a colloidal micropore
- Alessio Squarcini (Univ. Innsbruck)
Dimensional crossover via confinement in the lattice Lorentz gas. Exact results

Discussions & Coffee

Thu 11:20 – 12:45 Flows in Energy materials

- **Ignacio Pagonabarraga** (Univ. Barcelona)
Flow control and instabilities of heterogeneous confined flows
- Sonia Cambiaso, F. Rasera, A. Tinti, D. Bochicchio, Y. Grosu, G. Rossi, A. Giacomello (Univ. Genova)
Grafting heterogeneities rule intrusion and extrusion in nanopores
- Yoav Tsori, R. Kroll (Ben-Gurion Univ. Be'er Sheva)
Electrolubrication and giant slip in liquid mixtures in charged pores
- Closing remarks (5')

Posters

- (1) Mithun Chowdhury (IIT Bombay)
Nanotetrapods promote polymer flow through confinement induced packing frustration
- (2) Pallabi Das, C. Kurzthaler, M. Residori, S. Mandal, A. Voigt (MPI-PKS Dresden)
Interplay of flow and swimming in porous media
- (3) Stefani Alexandria Setiono, O. Yazaydin, M. Zhang, R. Reocreux (University College London)
Water diffusion in MOFs
- (4) Abolfazl Ahmadi Rahmat, M. Caraglio, V. Krakoviack, T. Franosch (Univ. Innsbruck)
Light-induced glass transition in colloidal monolayers
- (5) Mrityunjay Singh, P. Pilz, C. Schmidt-Hattenberger, I. Sass (Helmholtz Center for Geosciences, Potsdam)
Impact of high salinity on hydrogen diffusion: molecular dynamics simulations for Ketzin underground gas storage
- (6) Andrea Tagliabue, M. Bonaccorsi, F. Rasera, A. Tinti, S. Cambiaso, D. Bochicchio, G. Rossi, A. Giacomello (Univ. Genova)
Towards a realistic CG model for intrusion/extrusion processes in hydrophobically-functionalized mesoporous silica
- (7) Karnik Ram, J. Dijkman, B. Ensing, J.-W. Van de Meent, D. Cremers, M. Welling (TU Munich)
Neural free-energy functionals for non-equilibrium Brownian dynamics
- (8) Peter Pilz, B. Strauch, M. Zimmer, C. Schmidt-Hattenberger, I. Sass, M. Singh (GFZ Helmholtz Center for Geosciences, Potsdam)
Hydrogen diffusion experiments on potential storage and cap rocks – a laboratory-based experimental approach
- (9) Bappaditya Roy, N. Yoshinaga (Tohoku Univ. Miyagi)
Estimation of spatial and time scales of collective behaviors of active matters through learning hydrodynamic equations from particle dynamics
- (10) Ioachim Dusa, C. Schran (Univ. Cambridge)
First-principles phase behaviour of nanoconfined water at extreme conditions
- (11) Said Pashayev, S. Dutta, R. Fulcrand, O. Vincent (CNRS, Univ. Lyon)
Dynamics of evaporation and condensation of water and solutions in nanoporous glasses
- (12) Xin Zhong, F. Höfling, T. John (FU Berlin)
Hydrogen diffusion in garnet: insights from atomistic simulations