


PHYSICS OF DRYING
Conference
Nov., 5-7, 2018

Ecole des Ponts ParisTech,
Marne la Vallée, France

TENTATIVE PROGRAM (next pages)

Drying is ubiquitous in industry and our everyday life. It is a priori a complex process involving coupled vapor diffusion and liquid transport through a complex, multi-scale, soft or solid, porous structure. Despite this complexity, many recent researches now provide insight in, and rationalization of, the physical processes at work in drying of soils, building materials, colloids, gels, model porous systems, etc. The aim of this meeting, within the frame of the Chair Innovating solutions for sustainable housing (Saint-Gobain – Ecole des Ponts), is to gather experts and review significant improvements in our understanding in this scientific field.

Scientific Committee

J. Carmeliet, ETH Zurich - Empa
E. Gouillart, Lab. SVI, CNRS-Saint-Gobain
F. Lequeux, Lab. SIMM, ESPCI
O. Pitois, Lab. Navier, ENPC-IFSTTAR-CNRS
N. Shokri, Univ. Manchester
A. Vichot, Saint-Gobain Research Paris
P. Coussot, Lab. Navier, ENPC-IFSTTAR-CNRS
P. Laval, Saint-Gobain Placoplatre
L. Pauchard, Lab. FAST, CNRS-Univ. Paris-Sud
S. Quiligotti, Saint-Gobain Research Paris
M. Vandamme, Lab. Navier, ENPC-IFSTTAR-CNRS

Registration: 120 euros TTC, before Oct., 1, 2018

at https://www.azur-colloque.fr/DR01/inscription/fr

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In connexion with

INTERPORE

École des Ponts ParisTech

SAINT-GOBAIN

Monday, Nov. 5 – 13h30 – 18h

Civil and environmental engineering materials

Invited lecture: Wetting, absorption and drying in porous materials of the built environment
D. Derome, A. Kubilay, X. Zhou, A. Ferrari, A. Mazloomi, R. Fischer, M. Chen, C. Zhang, J. Carmeliet
Empa, Dübendorf

Water absorption and drying of recycled concrete aggregates
E. Keita[1], J. Naël-Redolfi[1,2], F. Thérédé[1,2], N. Roussel[1]
[1] *Laboratoire Navier (ENPC-IFSTTAR-CNRS)* - [2] *Chryso*

Heat exchanger design based on raw earth materials: application to the data centres cooling
C. Bouchenna, F. Huchet, L. Leguen, E. Hamard
IFSTTAR, Département MAST Laboratoire GPEM

Drying of bitumen emulsions
M. Goavec[1], V. Gaudefroy[2], S. Rodts[1], E. Keita[1], P. Coussot[1]
[1] *Laboratoire Navier (ENPC-IFSTTAR-CNRS)* - [2] *IFSTTAR, Département MAST, MIT*

Invited lecture: Plastic shrinkage of fresh cementitious materials: from mechanisms to mitigation strategies
S. Ghourchian[1,2], M. Wyrzykowski[1], **P. Lura**[1,2]
[1] *Empa, Swiss Federal Laboratories for Materials Science and Technology* – [2] *Institute for Building Materials, ETH Zurich*

Numerical simulation of the shrinkage of ceramic parts resulting from additive manufacturing process
H. Haddad, P. Michaud, N. Tessier-Doyen, J. Absi
Laboratoire irCer, Univ. de Limoges

X-ray dark-field contrast imaging of water transport during hydration and drying of early-age cement-based materials
M. Griffa[a], F. Yang[a,b], F. Prade[c], R. Kaufmann[a], J. Herzen[c], F. Pfeiffer[c,d], P. Lura[a,b]
[a] *Empa, Dübendorf* - [b] *Institute for Building Materials, ETH Zurich* - [c] *Dept. Physics and Munich School of Bioengineering, Technical University Munich* - [d] *Dept. of Diagnostic and Interventional Radiology, Technical University Munich*

Drying kinetics and subflorescence in Plaster
E. Keita[1], M. D. Seck[1,2], M. Van Landeghem[2], S. Rodts[1], P. Coussot[1]
[1] *Laboratoire Navier (ENPC-IFSTTAR-CNRS)* - [2] *Saint Gobain-Recherche, Aubervilliers*

Invited lecture: The surface evaporation capacitor – pore scale physics constrain global terrestrial evaporation
D. Or, P. Lehmann
Dept. Environmental Systems Science, ETH Zurich

Tuesday, Nov. 6 – 9h – 12h

Thermophysical properties of ceramic green bodies during drying
S. Oummadi[1] , A. Alzina[1],B. Nait-Ali[1], M. Mirdrikvand[2], W. Dreher[2], K. Rezwan[2]; D.S. Smith[1]
[1] *University of Limoges, IRCER* - [2] *University of Bremen, NW2-C*

Effect of Heat Transfer Limitations on the *in situ* Study of Water Evaporation Rates in Fuel Cell Gas Diffusion Layers
A. Mularczyk[1], Felix N. Büchi[1], Thomas J. Schmidt[1,2], Jens Eller[1]
[1] *Electrochemistry Laboratory, Paul Scherrer Institute Villigen* - [2] *Laboratory of Physical Chemistry, ETH Zürich*

Fundamental processes of drying or imbibition

Invited lecture: Drying of capillary porous media: an overview of some modelling issues
M. Prat
Institut de Mécanique des Fluides de Toulouse (IMFT)

Using a pore-network model to couple mass, momentum and energy at the interface between free flow and porous media flow
K. Weishaupt
Institut für Wasser- und Umweltsystemmodellierung, Stuttgart

Slow drying of aqueous suspensions and porous media
R. Denoyel, M. Nespoulous, S. Semenov, M. Antoni
Aix-Marseille Université, CNR, MADIREL

Capillary valve effect on drying of porous media
Rui Wu
School of Mechanical Enginnering, Shanghai Jiao Tong University, Shanghai

Control of evaporation by geometry in capillary structures
C. Chen[1,2,3], **P. Duru**[1], P. Joseph[2], S. Geoffroy[3], M. Prat[1]
[1] *IMFT* - [2] *LAAS-CNRS, Univ. de Toulouse* - [3] *LMDC, Univ. De Toulouse, UPS, INSA*

Invited lecture: Desorption: drying at the nanoscale?
B. Coasne
Laboratoire Interdisciplinaire de Physique, CNRS/Univ Grenoble Alpes

Tuesday, Nov. 6 – 13h – 17h30

Spontaneous Imbibition and Drying-Induced Deformation in Nanoporous Solids
P. Huber
Hamburg University of Technology

Highly porous layers of silica nano-spheres sintered by drying: Scaling up of the elastic properties
A. Lesaine[1,2], D. Bonamy[2], G. Gauthier[1], C.L. Rountree[2], V Lazarus[1,3]
[1] *Laboratoire FAST, Univ. Paris-Saclay* - [2] *SPEC, Univ. Paris-Saclay* - [3] *IMSIA, Univ. Paris-Saclay*

Imbibition, pervaporation and drying in 3 nm diameter pores
O. Vincent[(a,b)], B. Marguet[(b)], A. Szenicer[(b)], A. D. Stroock[(b)]
[(a)] *Univ. of Lyon, Institut Lumière Matière* - [(b)] *Cornell University, Robert Frederick Smith School of Chem. and Biomolecular Eng.*

Sublimation front structures in lyophilization of frozen particle packings: estimates from neutron radiography
P. Först[1], **N. Vorhauer**[2], M. Hilmer[1], S. Gruber[1], A. Zwaid[2], M. Schulz[3], J. Peters[3], E. Tsotsas[2]
[1] *Chair of Process Systems Eng., TU Munich* - [2] *Inst. Process Eng., Univ. Magdeburg* - [3] *Heinz Maier-Leibnitz Zentrum, TU Munich*

Drying: a simple suction process?
N. Ben Abdelouahab[1,2], A. Gossard[2], S. Rodts[1], B. Coasne[3], P. Coussot[1]
[1] *Univ. Paris-Est, Laboratoire Navier (ENPC-IFSTTAR-CNRS)* - [2] *CEA Marcoule* - [3] *LIPhy (CNRS, Univ. Grenoble-Alpes)*

Biological systems

Invited lecture: Modelling the drying of lignocellulosic products: physical phenomena, dynamic of coupled transfers and memory effects

P. Perré
LGPM, CentraleSupélec, Univ.Paris-Saclay

Drying of a water-filled channel within an artificial leaf

B. Dollet[a*], J.-F. Loufa[b], M. Alonzo[a], F. Mesple[a], K. H. Jensen[b], P. Marmottant[a]
[a] *LIPhy (CNRS, Univ. Grenoble-Alpes)* - [b] *Dept. of Physics, Technical University of Denmark*

Capillary imbibition governed by water adsorption in hygroscopic plant-like structure

M. Zhou, S. Caré, A. King[+], D. Courtier-Murias, S. Rodts, G. Gerber, P. Aimedieu, M. Bornert, P. Coussot*
Univ. Paris-Est, Laboratoire Navier (ENPC-IFSTTAR-CNRS) - [+] *Synchrotron SOLEIL*

Measuring moisture content distribution in wood during imbibition by micro-tomography

B. Martin[1,2], J. Colin[2,3], P. Lu[2], M. Mounkaila[2], J. Casalinho[3], P. Perré[2,3] et R. Rémond[1]
[1] *LERMAB, Univ. de Loraine, ENSTIB* - [2] *LGPM, CentraleSupélec, SFR Condorcet, Univ. de Paris-Saclay, CEBB*- [3] *LGPM, CentraleSupélec, Univ. Paris-Saclay*

Investigation of the water diffusion in wood by terahertz techniques

A. Alkadri*[1,2], N. Dyakonova[3], D. Coquillat[3], O. Arnould[2], D. Jullien[2], J. Gril[4]
[1]*Henri Selmer Paris* – [2] *LMGC, Univ. Montpellier, CNRS* - [3]*Lab. Charles Coulomb, Univ. Montpellier – CNRS* [4]*Institut Pascal, Univ. de Clermont Auvergne – CNRS - Sigma*

Structure of biological colloids revealed by drying cracks formation

C. Le Floch-Fouéré [a], L. Lanotte [a], R. Jeantet, L. Pauchard [b]
[a] *Laboratoire STLO, INRA, Agrocampus Ouest* - [b] *Laboratoire FAST, Univ. Paris-Saclay*

Wednesday, Nov. 7 – 9h – 12h30

Invited lecture: Drying of soft cellular foods: insights from multiscale modeling and imaging

T. Defraeye
Empa, St-Gallen

Convectif solar drying of Moroccan truffle slices (*Terfezia boudieri*)

Z. Tagnamas, Y. Bahammou, Mn. Kouhila, A. Lamharrar, A. Idlimam
Team of Solar Energy & Aromatic and Medicinal Plants, ENS Marrakesh, Physics Department

Microwave vacuum drying and rehydration behavior of Peruvian carrot chips

K. Soares de Mendonça; J. Renato de Jesus Junqueira; P. Giarola da Silveira; **J. Luiz Gomes Corrêa***
Univ. Fed. de Lavras, Dept. de Ciência dos Alimentos, Lavras, Brazil

Drop and films

Invited lecture: Phase inversion patterns in the drying of emulsions

J. Sprakel
SprakelLab (Physical Chemistry & Soft Matter, Wageningen University)

Drying drops: from flowers to coffee-stain

P. Bourrianne, T. Nirca, E. Yin, I. Bischofberger
Mechanical Engineering, MIT, Cambridge

Blade-coating of colloidal dispersions in the evaporative regime

F. Doumenc[1,2] J.-B. Salmon[3] C. Loussert[3], V.S. Nikolayev[4], B. Guerrier[1]
[1] *Lab. FAST, Univ. Paris-Saclay* - [2]*Sorbonne Universités* - [3] *LOF, Bordeaux Univ., CNRS, Solvay* - [4] *CEA Saclay*

Controlling the drying Induced Peeling of Colloidal Films

A. Osman[1], L. Goehring[2], H. Stitt[3], N. Shokri[1]
[1] *School of Chemical Eng. and Analytical Science, The University of Manchester* – [2] *School of Science and Technology, Nottingham Trent Univ.* – [3] *Johnson Matthey Technology Centre, Billingham*

How coatings with hydrophobic particles may change the drying of water droplets: incompressible surface versus porous media effects

B. Laborie, F. Lachaussée, E. Lorenceau, **F. Rouyer**
Univ. Paris-Est, Laboratoire Navier (ENPC-IFSTTAR-CNRS)

Drying of colloidal dispersions within confined drops

J.B. Salmon, A. Bouchaudy, C. Loussert
LOF, UMR 5258 CNRS/Solvay/Université de Bordeaux

A mechanistic view of drying suspension droplets

H.M. van der Kooij, G.T. van de Kerkhof, J. Sprakel
Physical Chemistry and Soft Matter, Wageningen University, Stippeneng 4, 6708 WE Wageningen, the Netherlands

Wednesday, Nov. 7 – 13h30 – 16h

Drying-induced transport of ions and particles

Invited lecture: Evaporation-driven salt polygons

L. Goehring
Nottingham Trent Univ.

Saline water evaporation from porous media in the presence of a water table

N. Shokri, S.M.S. Shokri-Kuehni
School of Chemical Engineering and Analytical Science, The University of Manchester

Drying of a porous medium with salt crust formation

G. Licsandru[a,b], C. Noiriel[b], S. Geoffroy[c], A. Abou Chakra[c], P.Duru[a], M. Prat[a]
[a] *Institut de Mécanique des Fluides de Toulouse* - [b] *Géosciences environnement Toulouse* – [c] *Lab. Matériaux et Durabilité des Constructions, Toulouse*

Hyperslow drying of a salt solution in a PDMS porous medium

A. Naillon[1,2,3], P. Joseph[2], M. Prat[1]
[1] *Institut de Mécanique des Fluides de Toulouse* [2] *LAAS-CNRS, Univ. Toulouse* - [3] *LRP, Univ. Grenoble Alpes, CNRS*

Invited lecture: Making Rubber Gloves

A.F. Routh and R. Groves
Dept. of Chemical Engineering & Biotechnology and BP Institute, University of Cambridge