Contribution ID: **191** Type: **Oral Presentation**

Study of convective drying of a mortar with a paste cover by NMR and MRI

Friday, 4 June 2021 15:00 (15 minutes)

The convective drying of a composite system made of a porous medium covered with a paste is a situation often encountered with soils, building, cultural heritage materials [1] and recently in decontamination of cementitious materials in nuclear facilities [2]. The aim of this study is to understand the convective drying behaviour of an initially saturated mortar. For simple porous systems (soils, bead packings, etc) the drying rate is constant during a long first period, thanks to capillary effects tending to redistribute homogeneously the liquid and thus continuously transport liquid towards the free surface of the sample where it evaporates. This is followed by a second period of drying rate decrease, generally associated with the development of a dry front [3]. For our mortar the drying rate continuously decreases from the beginning of the test, indicating a process in which the driving force is not capillarity. Yet, the spatial distribution of moisture content in mortar during drying obtained from Magnetic resonance imaging reflects a homogeneous desaturation of the sample, showing that there is a driving effect throughout the sample. At last, dynamic relaxometry by Nuclear Magnetic Resonance gives us the distribution of relaxation time in the system while it dries, which allows to know the history of pore emptying in time. The capillary pores (50-600 nm) appear to dry first, followed by inter-CSH pores (2-10 nm), while intra-CSH pores (0.5-1.8 nm) remains saturated. We suggest that the drying of such a material relies on the slow diffusion of the liquid through a continuous structure of inter-CSH pores. We also explored the drying behaviour of a mortar sample covered with an initially wet paste layer.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

[1] Bourgès, A., & Vergès-Belmin, V. (2008). Comparison and optimization of five desalination systems on the inner walls of Saint Philibert Church in Dijon, France. Salt Weathering on Buildings and Stone Sculptures, 22–24 October 2008, The National Museum Copenhagen, Denmark, 29-40.
[2] M. N. B. BEN ABDELOUAHAB, « Développement d'un procédé super-absorbant pour la décontamination nucléaire en profondeur de matériaux poreux », Université Paris-Est, 2019.
[3] N. Ben Abdelouahab, A. Gossard, S. Rodts, B. Coasne, et P. Coussot, « Convective drying of a porous medium with a paste cover », Eur. Phys. J. E, vol. 42, no 5, p. 66, mai 2019, doi: 10.1140/epje/i2019-11829-4.

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Primary authors: DIALLA, Hicham (CEA, DES, ISEC, DMRC, Univ Montpellier, Marcoule, France - Lab. Navier, Ecole des Ponts, Univ Gustave Eiffel, CNRS); MAILLET, Benjamin (Lab. Navier, Ecole des Ponts, Univ Gustave Eiffel, CNRS); Dr GOSSARD, Alban (CEA, DES, ISEC, DMRC, Univ Montpellier, Marcoule, France); Dr CHAMPENOIS, Jean-Baptiste (CEA, DES, ISEC, DE2D, Univ Montpellier, Marcoule, France); Dr COUSSOT, Philippe (Lab. Navier, Ecole des Ponts, Univ Gustave Eiffel, CNRS)

Presenter: DIALLA, Hicham (CEA, DES, ISEC, DMRC, Univ Montpellier, Marcoule, France - Lab. Navier, Ecole des Ponts, Univ Gustave Eiffel, CNRS)

Session Classification: MS13

Track Classification: (MS13) Fluids in Nanoporous Media