

Localized Proton-NMR on cement paste

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Objectives:

This project aims to link anomalous water sorption and time-dependent microstructure in cement paste using spatially resolved GARfield Proton Nuclear Magnetic Resonance analysis.

Anomalous Sorption

Water uptake into the porous network of cement sample is non-linear with the square root of time. This deviation is believed to be due to several reasons: delayed hydration, carbonation, microcracking, swelling, hysteresis, or environmental effects.

GARField Proton NMR

This method operates on using high magnetic gradients which enable localized measurements of the waterfilled pores. This method can measure pores at the scale of microns, and detects at depths less than 1 mm below a thin cement paste sample.

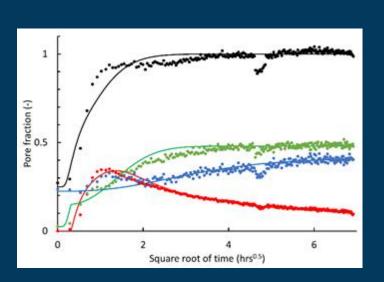
Interpreting Time-Dependent Data

A model is developed that considers an effective capillary diffusion coefficient that is dependent on the instantaneous, exponentially relaxing towards a saturation dependent pore size distribution.

Time constants for relaxing porosity in de/sorption experiments

Sorption shows at least two time consants for each pore populations at 2 hours and 12 hours.

During drying we only observe one time constant of 10 minutes. Differences arise due to different mechanisms, capillary action vs. vapor transport.



For further information please refer to the following link: https://www.erica-etn.eu/ This project has received funding by the EU H2020-MSCA-ITN-2017 Grant Agreement no. 764691