Upscaling towards Applications: Water Transport in Agglomerates

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Objectives:
This research focuses on understanding anomalous water transport in hydrate agglomerates in terms of changing microstructure by pore-size resolved magnetic resonance imaging (MRI) measurements.

Water Transport in Cement

The durability of concrete is closely related to the transport properties of water within the cementitious matrix. Water carries aggressive ions such as sulfates and chlorides that causes corrosion thus damage the material.

Why MRI?

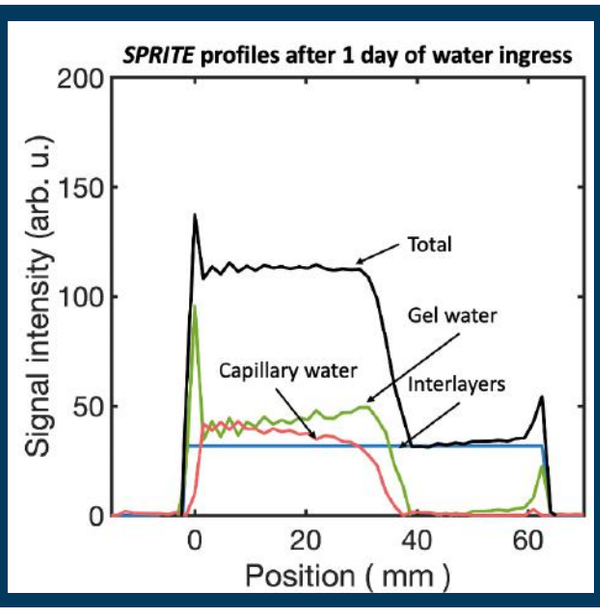
MRI is a powerful non-destructive method used to visualise where water is within a sample but also, through spin relaxation time contrast, used to provide information on the locally filled pore size distribution. We use ^{1}H SPRITE MRI methods to distinguish water in hydrate interlayer, gel (nanometre) and capillary (micron) sized pores during repeated wetting and drying cycles.

Cement Diffusivity

Capillary diffusivities coefficients of particular pore components were estimated by fitting SPRITE data to a transport model that includes the effects of dynamic porosity. The mechanical pore relaxation time associated with porosity changes during saturation is seen to increase with the period over which the sample is dried. Relaxation time increases from τcap ~ 55 h to τcap ~ 250 hours for sample

How do drying and wetting cycles affect cement microstructure?

This MRI study shows that drying severity and sorption history influence C-S-H microstructure and so permeability/diffusivity. Pore size redistribution with different porosity relaxation time is observed depending on the sample history.



For further information please refer to the following link: https://www.erica-etn.eu/
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