P6:Wetting and drying cycles- the effects of hysteresis on transport

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A native of Iran, Mahsa Saeidpour got her MS in Material engineering (Ceramics) in Iran University of science and Technology (IUST) in Iran in 2010.she started to work at Lund University Feb 1st 2011.

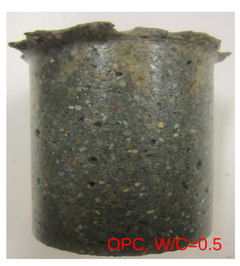
Overview

The research program in project 6 mainly concerns experimental work on sorption and diffusion properties of water on pastes and mortars made from five different binders that planed to be studied in transcend project. All samples will be sealed cured for 90 days at 20 °C and handled in CO_2 free atmosphere. In this project we will quantify water vapor sorption (including hysteresis and scanning curves) and transport parameters for five binder systems, with the aim of correlating such properties with structural information from other Transcend projects.

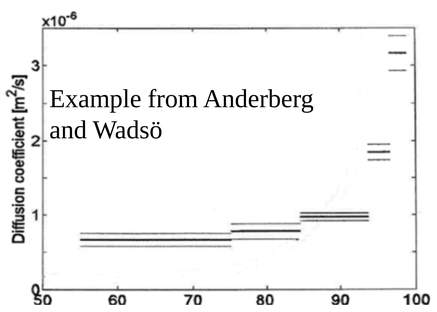
Steady-state cup measurements

Casting: To keep the temperature increase during hydration below 3 K we use fans to cool the steel mould . The mould should be totally impermeable.
Samples preperation: Ccylinders are going to be drilled from casted samples after demoulding after 90 days of hydration. The cylinders are then cut in thin slices (12mm) and mounted on cups.

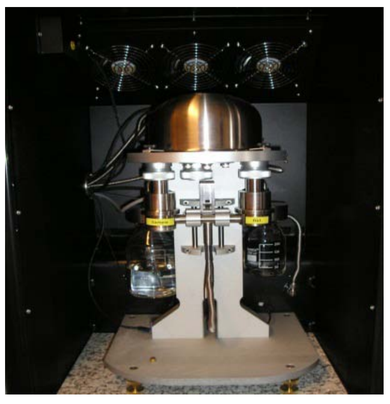
The relative humidity inside the cups controls with saturated salt solutions. It is possible to measure diffusion coefficient in different RH intervals. The slices were cut from drilled cores , and were suction saturated before placed on top of the cups.
After drilling the cubes of OPC + slag samples we see a different color in top and bottom of sample. We have a plan to study water diffusion in 3 different level of sample (top, middle, bottom)

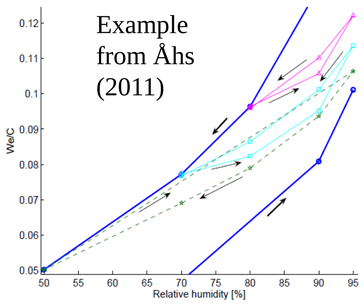


To avoid carbonation during measuring we have a plan to use sealed boxes to measure the weight without taking the samples out of the box.
Measurements will be made during two desorption-absoption cycles to assess the influence of hysteresis on transport.



Absorption and desorption curves (including hysteresis and scanning curves)

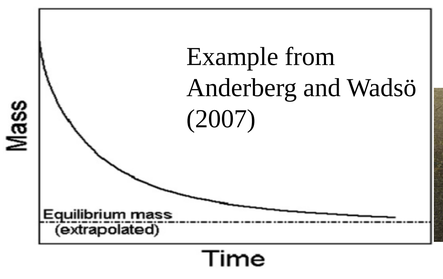


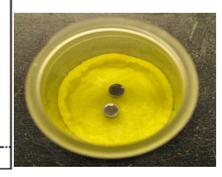


The samples in this study will be the crushed of pastes of all 5 cements in Transcend program. Measurements will be made with sorption balances.

Sorption isotherms and diffusion coefficient by dynamic sorption

The samples are casted mortar and pastes in defined shape steel tubes (d=5.5, h=5 mm) which will gives one dimensional transport in the sorption balance instruments.



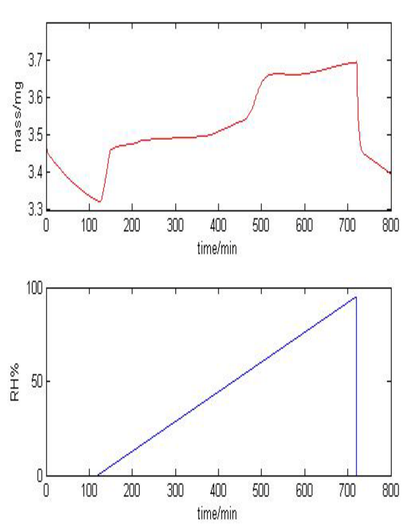


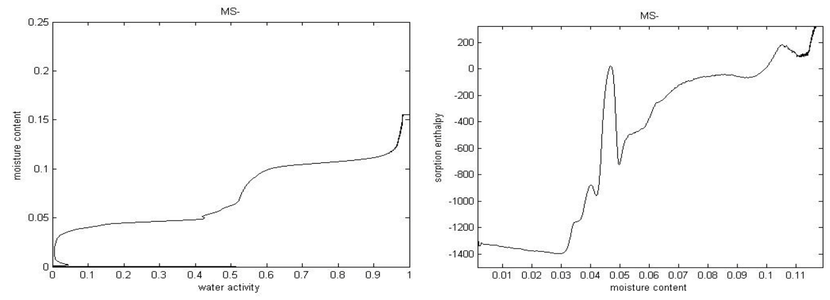
$$D = \frac{\pi L^2}{16}\left(\frac{dE}{d\sqrt{t}}\right)^2$$

The sample were suction saturated at RH=100% before starting the measurement in DVS equipment. The D will be measured at first desorption and absorption and second desorption steps.

Collaboration

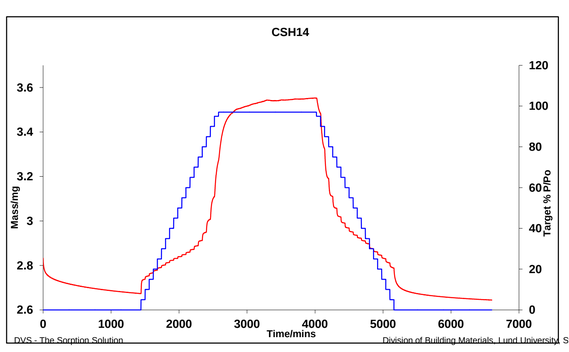
1- **Sorption calorimetric and sorption isotherms of synthesized cement phases (collaboration with project 13)**

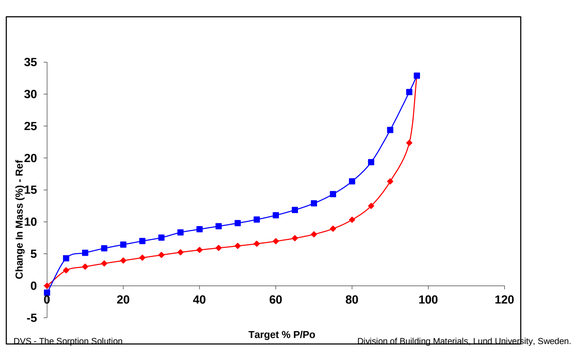


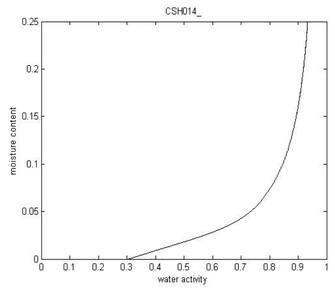


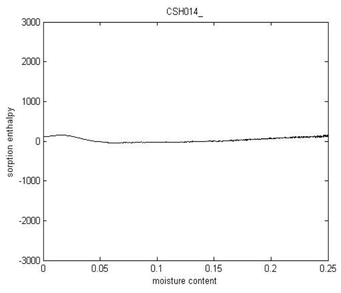
In this part of study synthesized cement phases water vapour sorption by using two different kinds of ramp and step changes in RH and enthalpy of sorption by using sorption calorimetric has been studied. 3 samples of Monosulfoaluminate, OH_AFm ,Monocarboaluinate has been studied.

2- **Sorption calorimetric and sorption isotherms of synthesized C-S-H (collaboration with project 13, 8)**









In this part of study synthesized C-S-H phase water vapour sorption by and enthalpy of sorption by using sorption calorimetric has been studied.

3- **Sorption calorimetric of hydrated cement paste (collaboration with project 10)**

In this part of study hydrated cement paste of OPC and OPC+slag enthalpy of sorption by using sorption calorimetric is going to be studied. The aim is study the surface sorption properties of cement pastes.

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