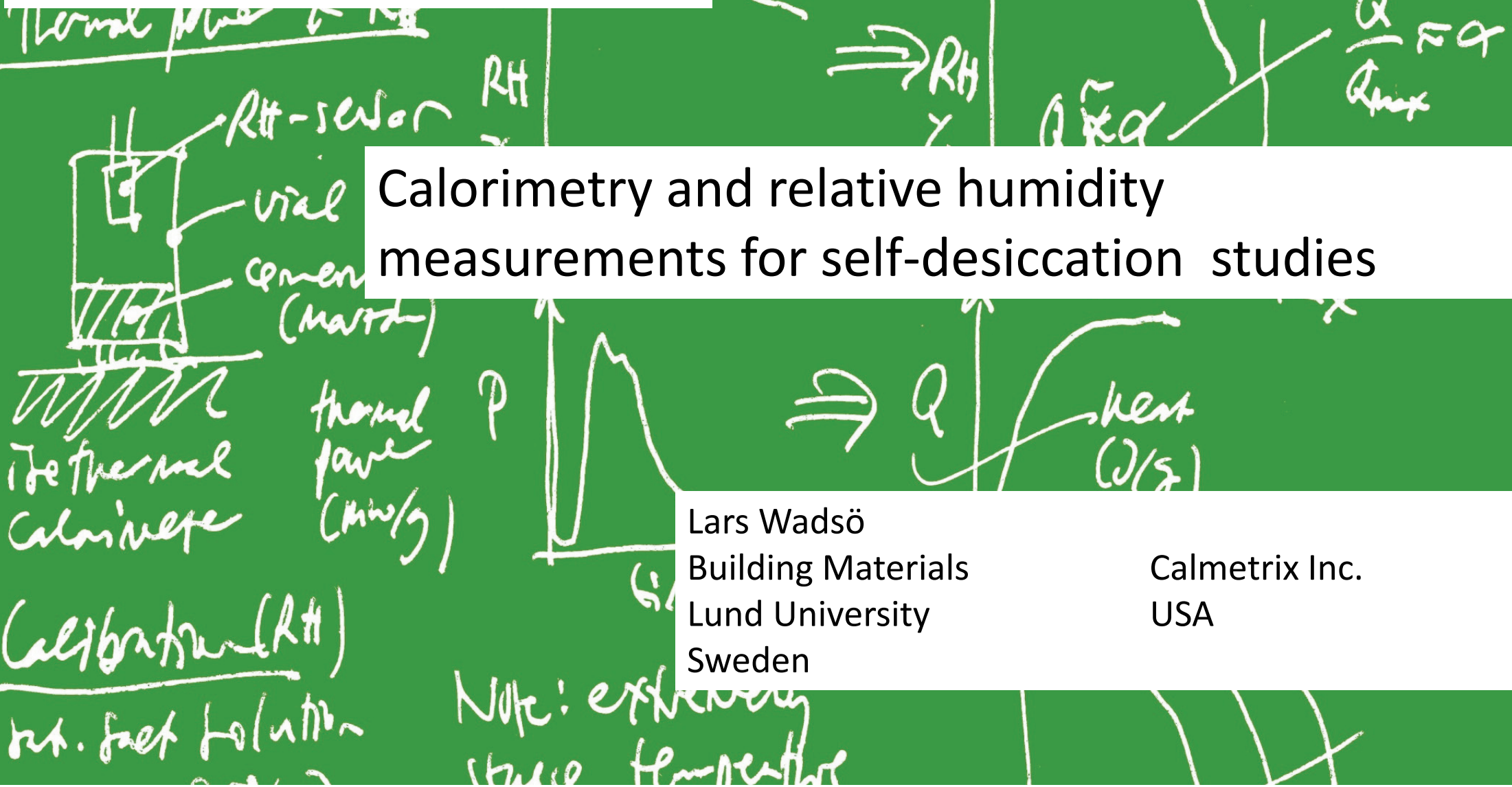


4th European Cement Calorimetry Conference
Dresden, Germany, 11-12 Dec 2018

Calorimetry and relative humidity measurements for self-desiccation studies

Lars Wadsö
Building Materials
Lund University
Sweden

Calmetrix Inc.
USA



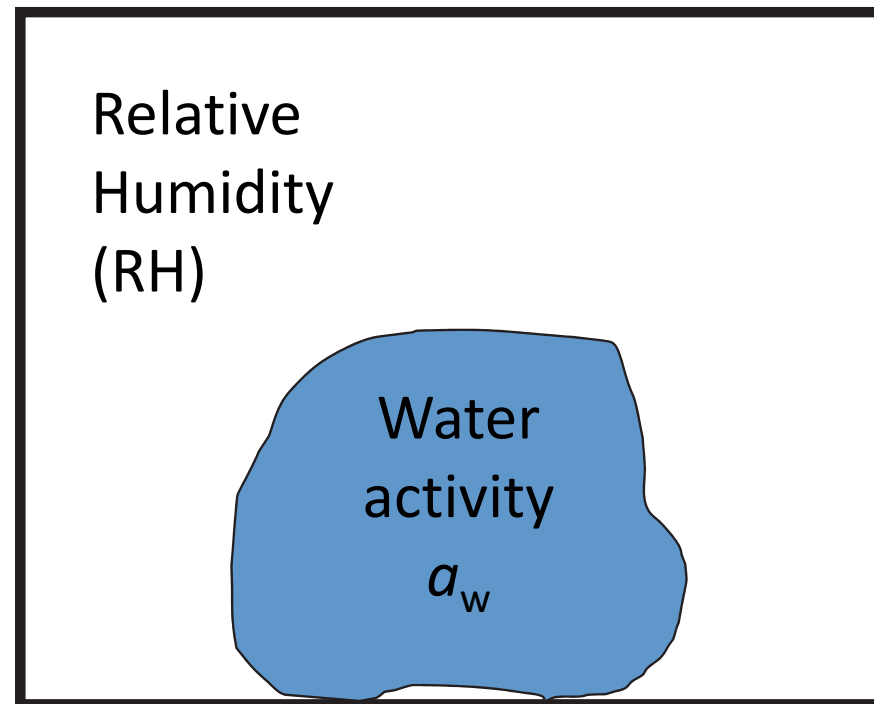
Background:

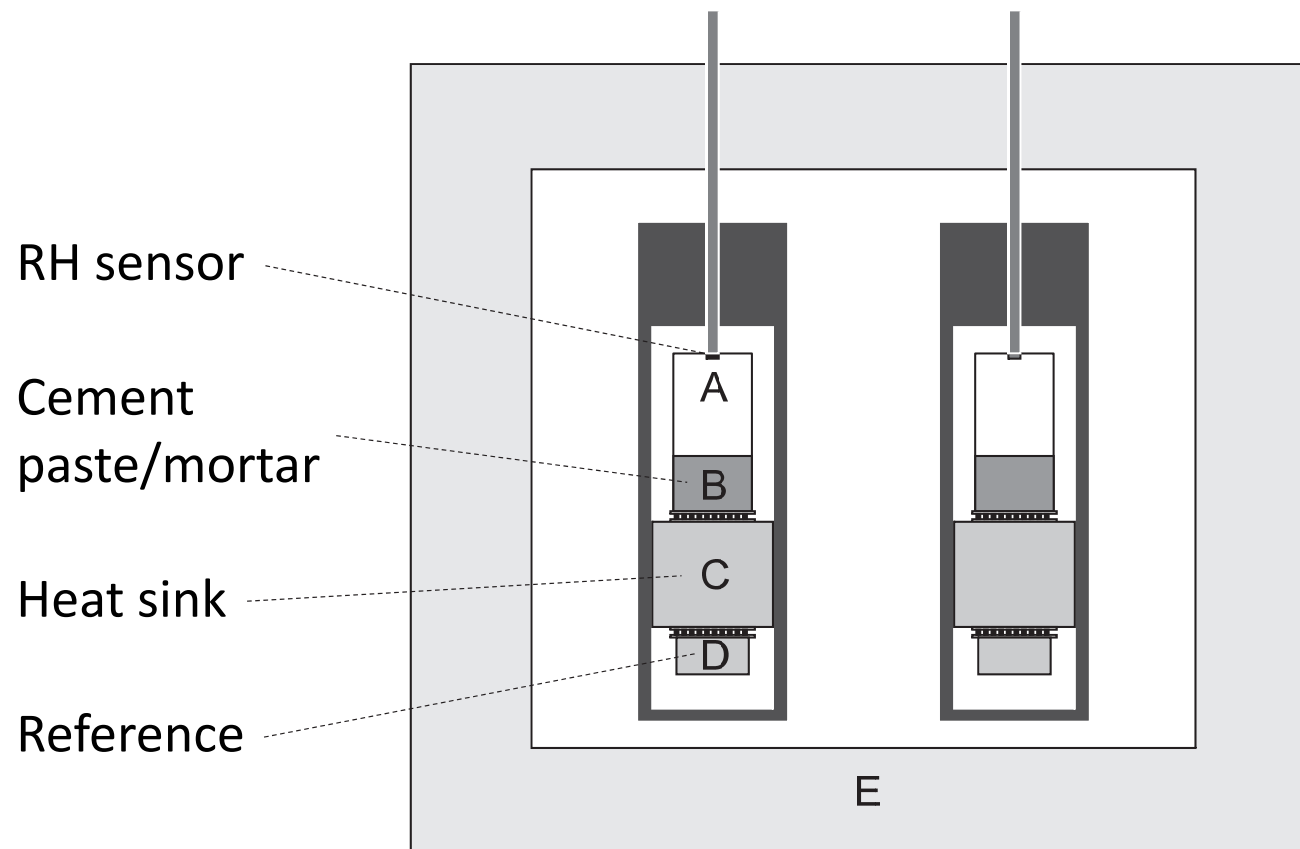
- High use of self-desiccating concrete in Sweden
- Relative humidity is an interesting property of a hydrating system (shrinkage...)
- It is interesting to combine calorimetry with other methods:

pH oxygen carbon dioxide pressure gas analysis

Nanocem project Lund and EMPA: electrical conductivity
shrinkage
relative humidity
setting by ultrasound

At equilibrium: $RH = a_w$





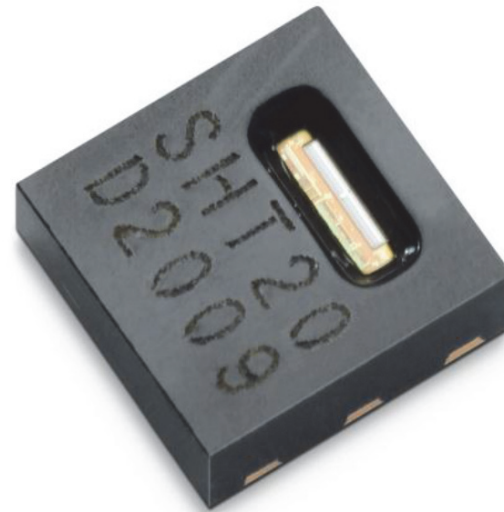
What type of relative humidity sensor?

- Type: capacitive
- Small
- Low heat production
- Stable
- Inexpensive

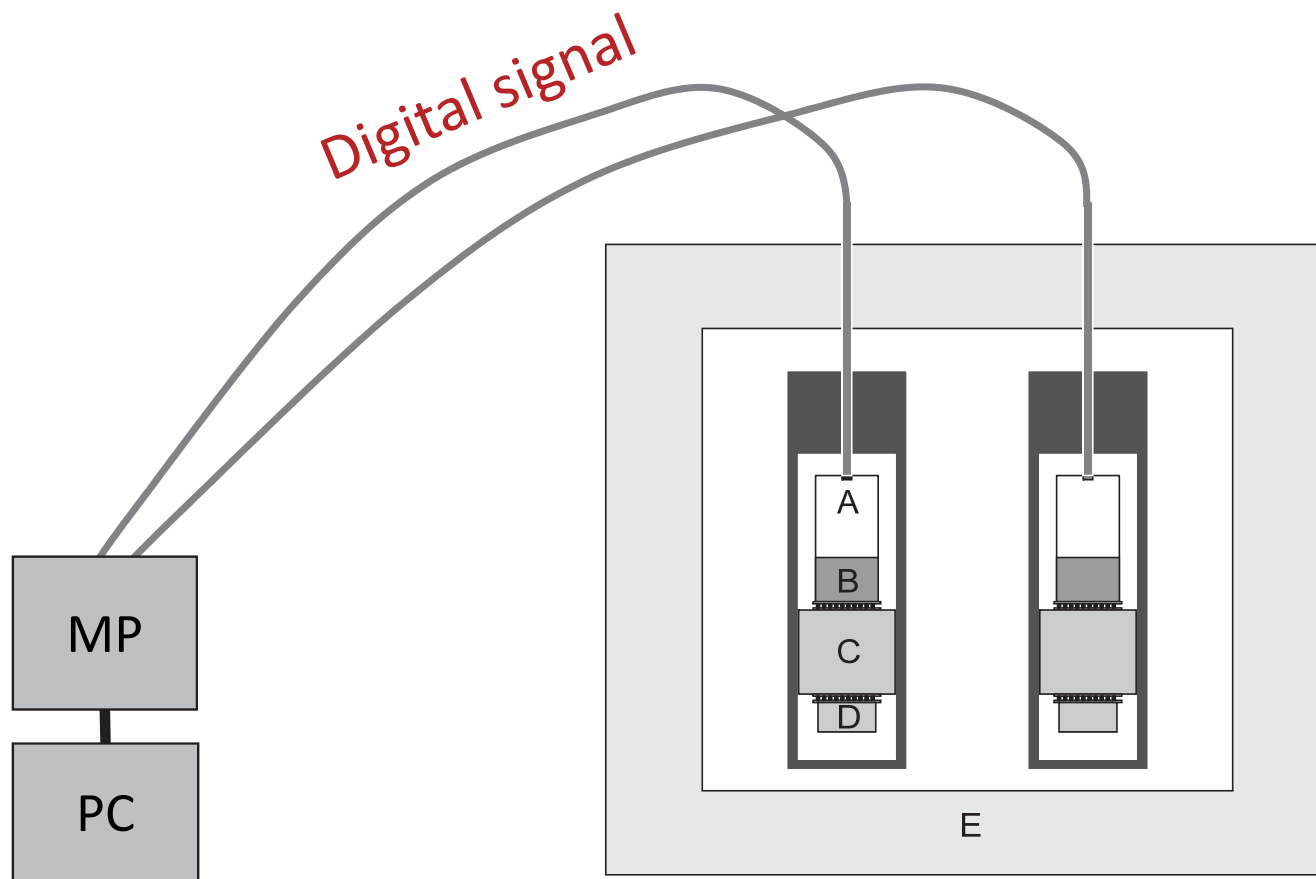
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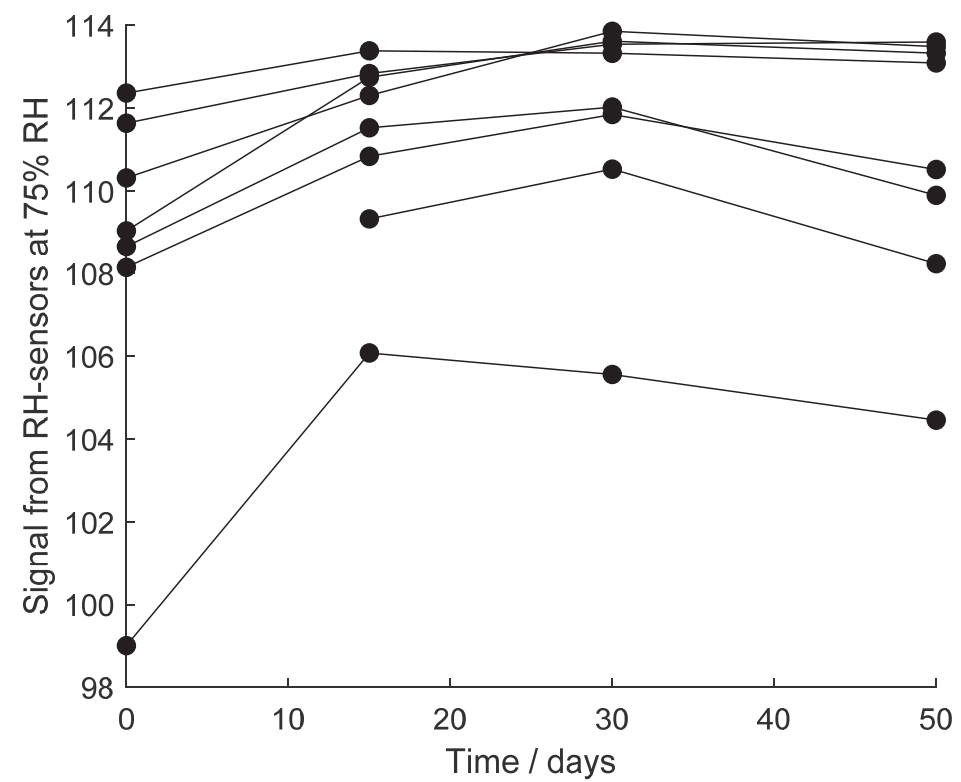
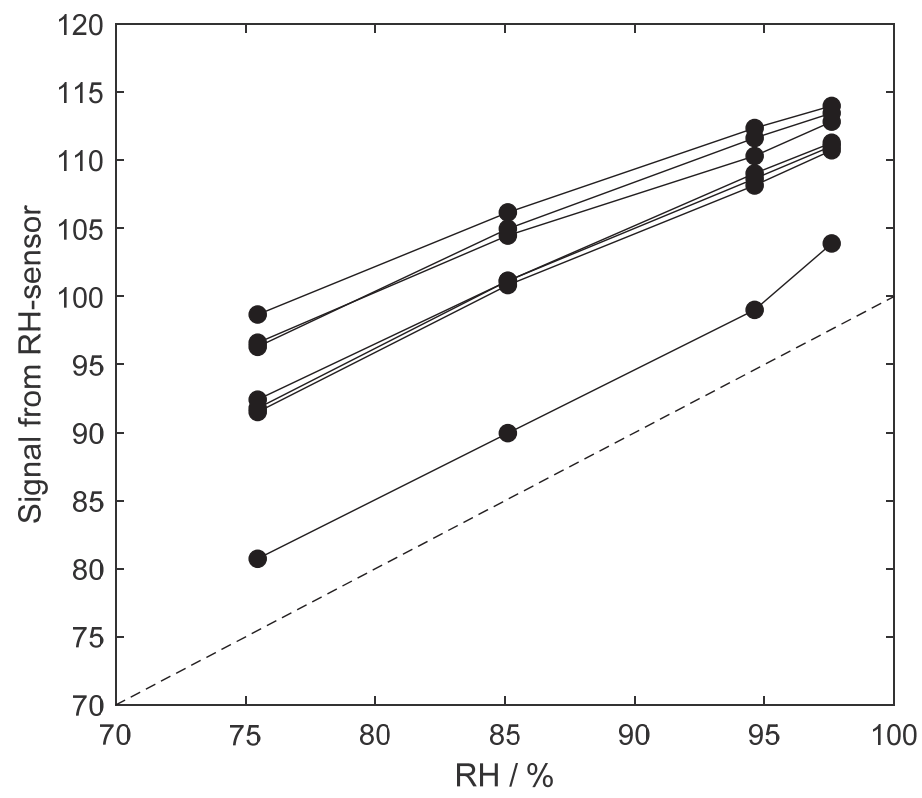
SENSIRION
THE SENSOR COMPANY



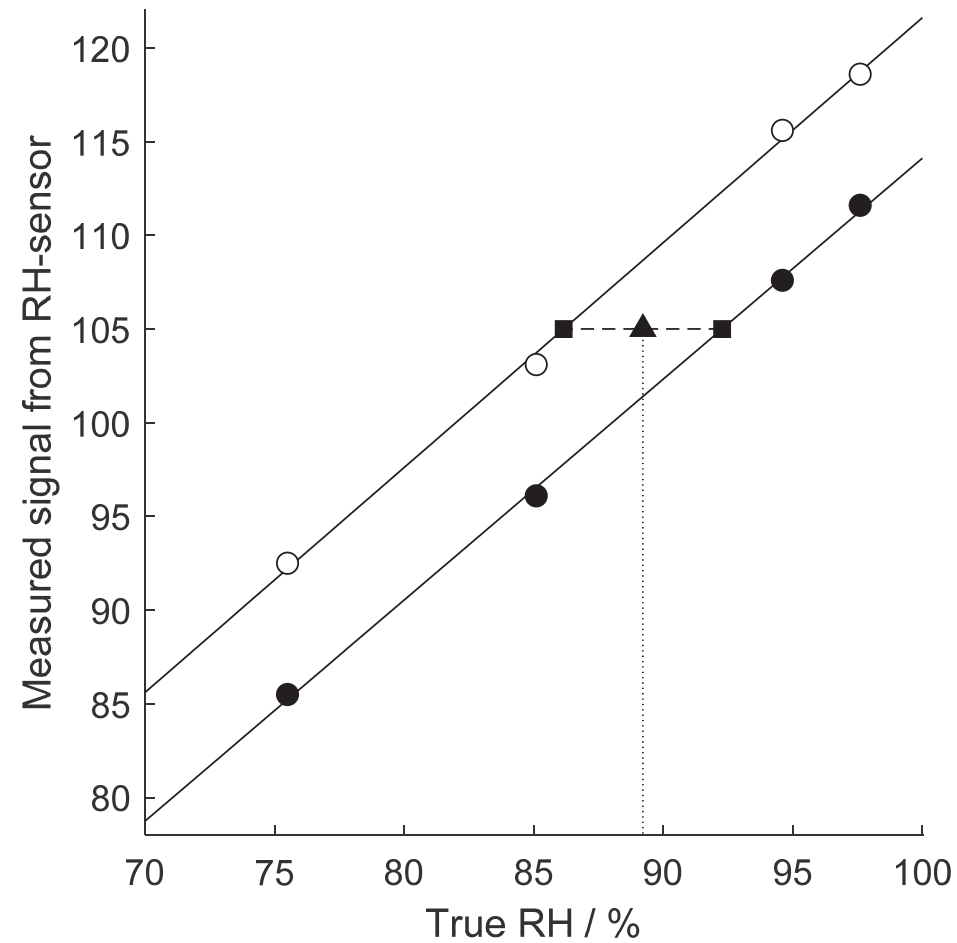
3 mm × 3 mm



Frequent calibration of RH-sensors needed

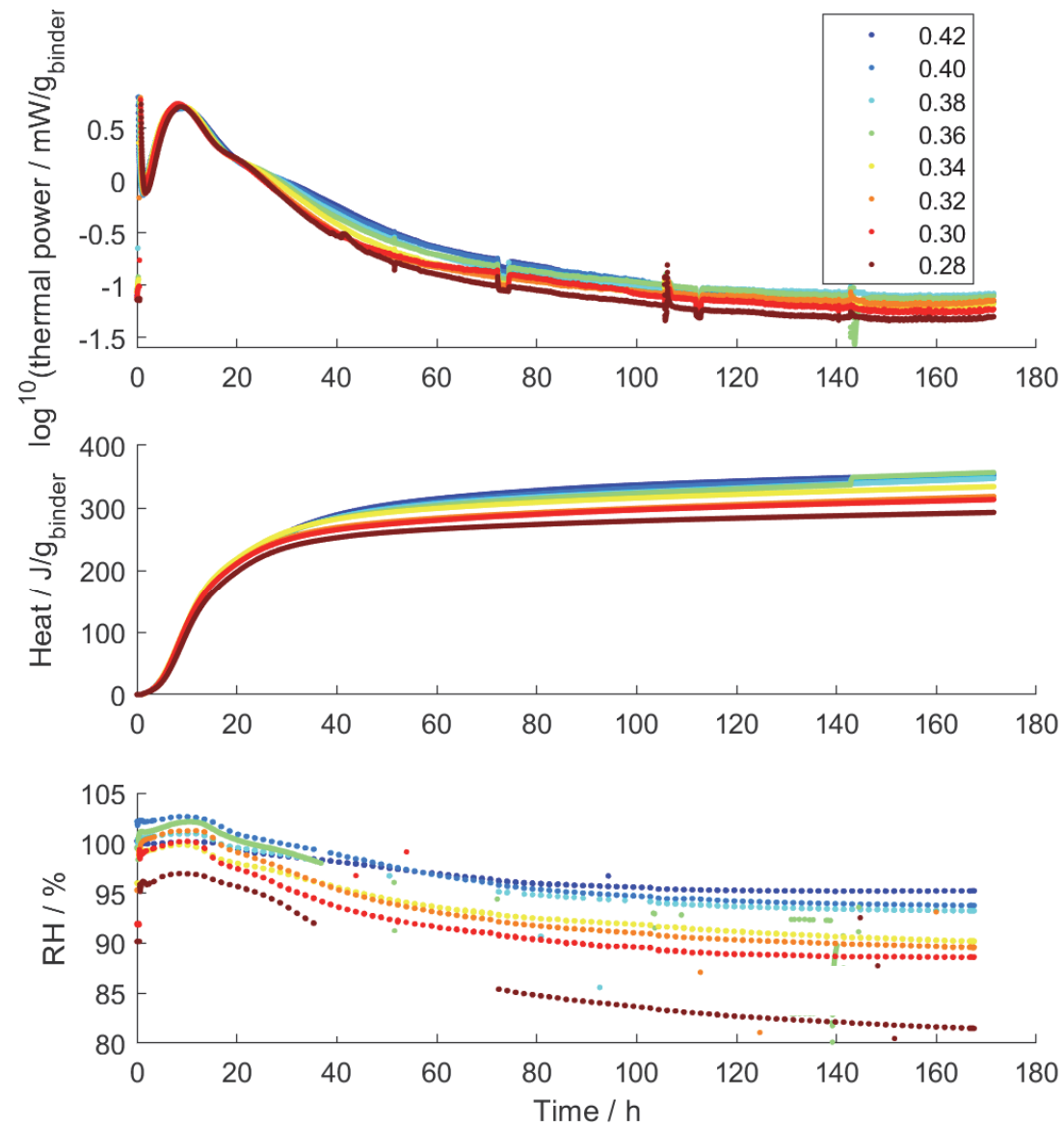


Calibration of RH-sensors before and after each hydration measurement, and interpolation



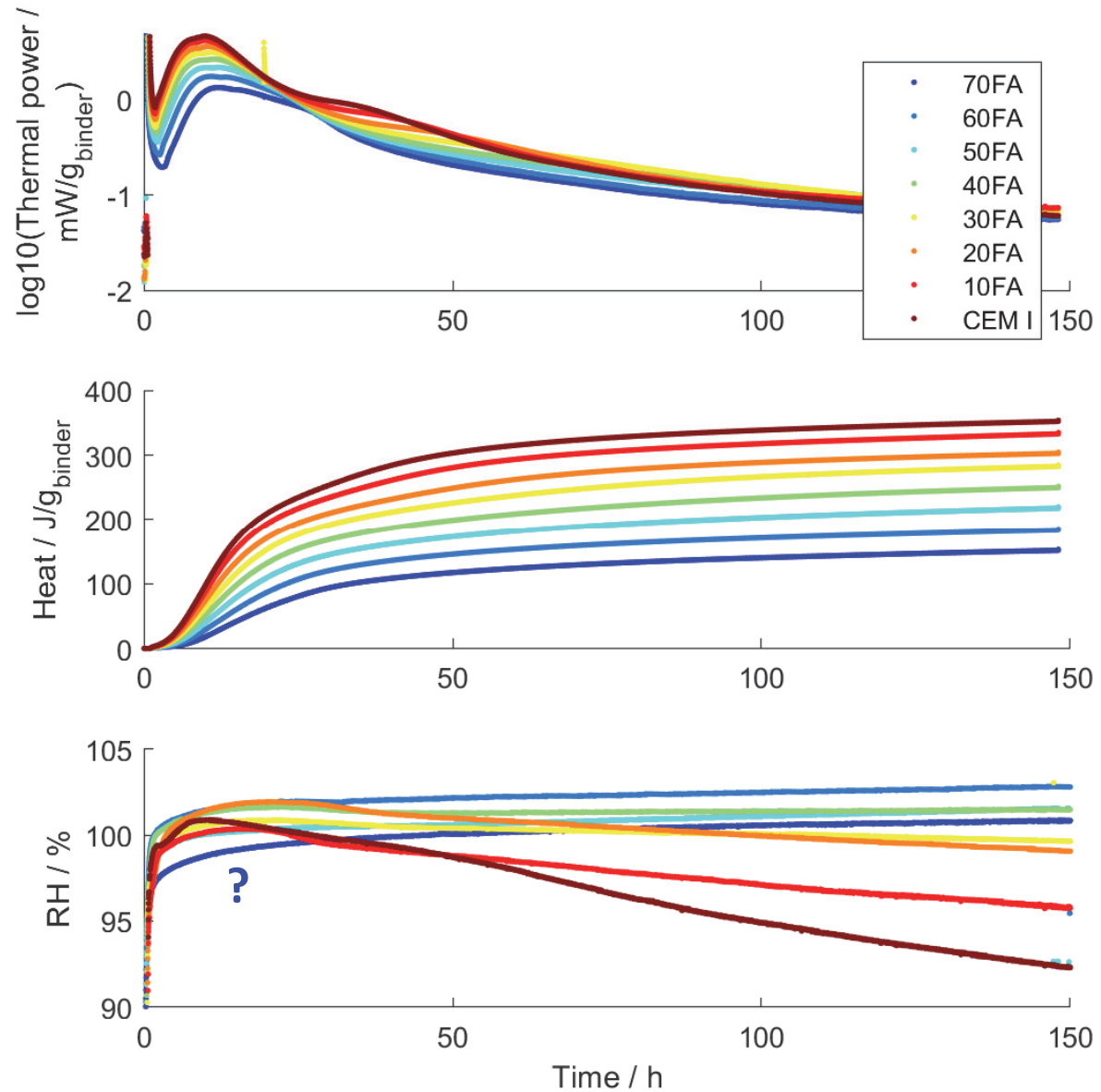
CEM I

with different w/c



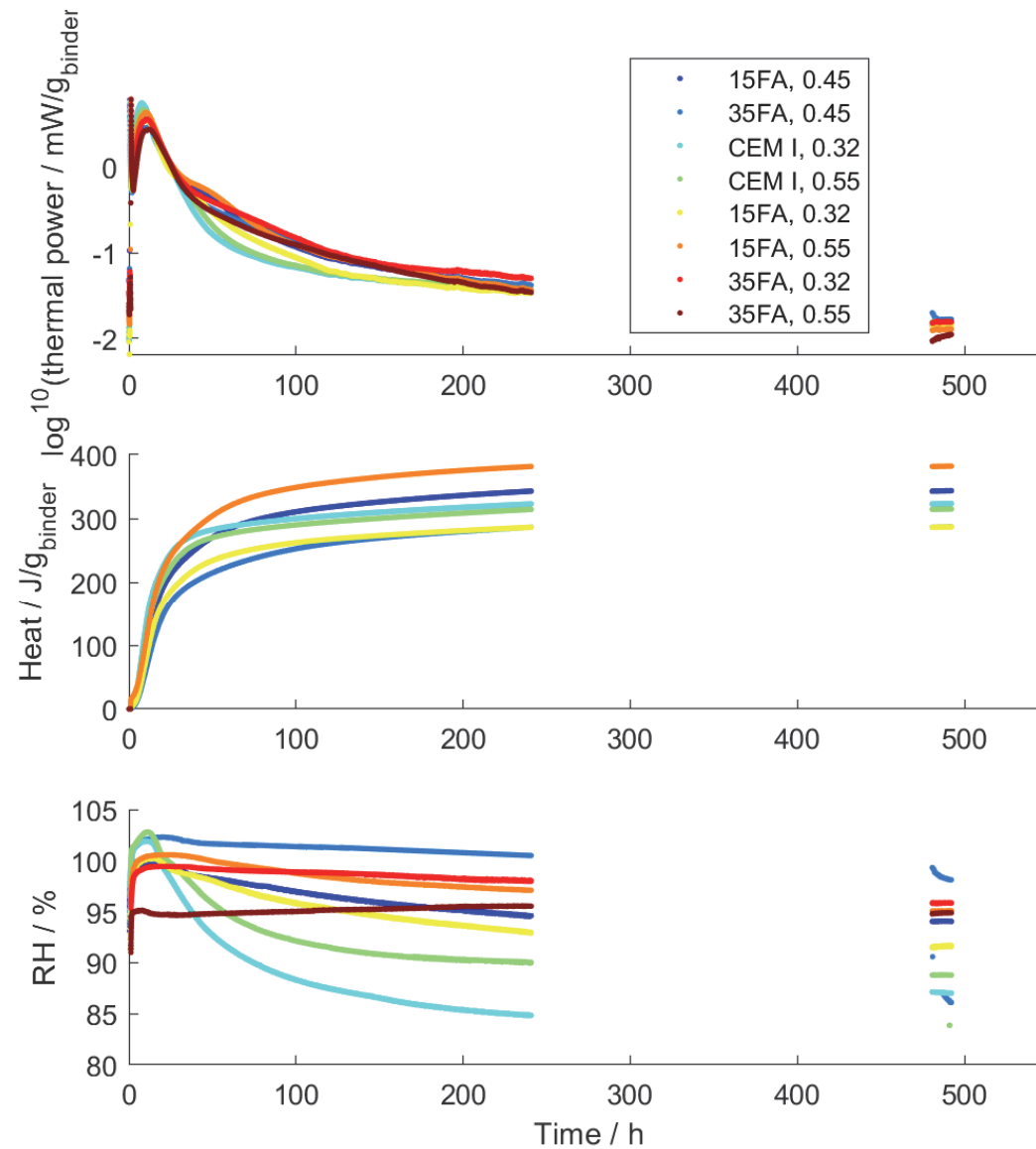
CEM I

with different fly-
ash additions

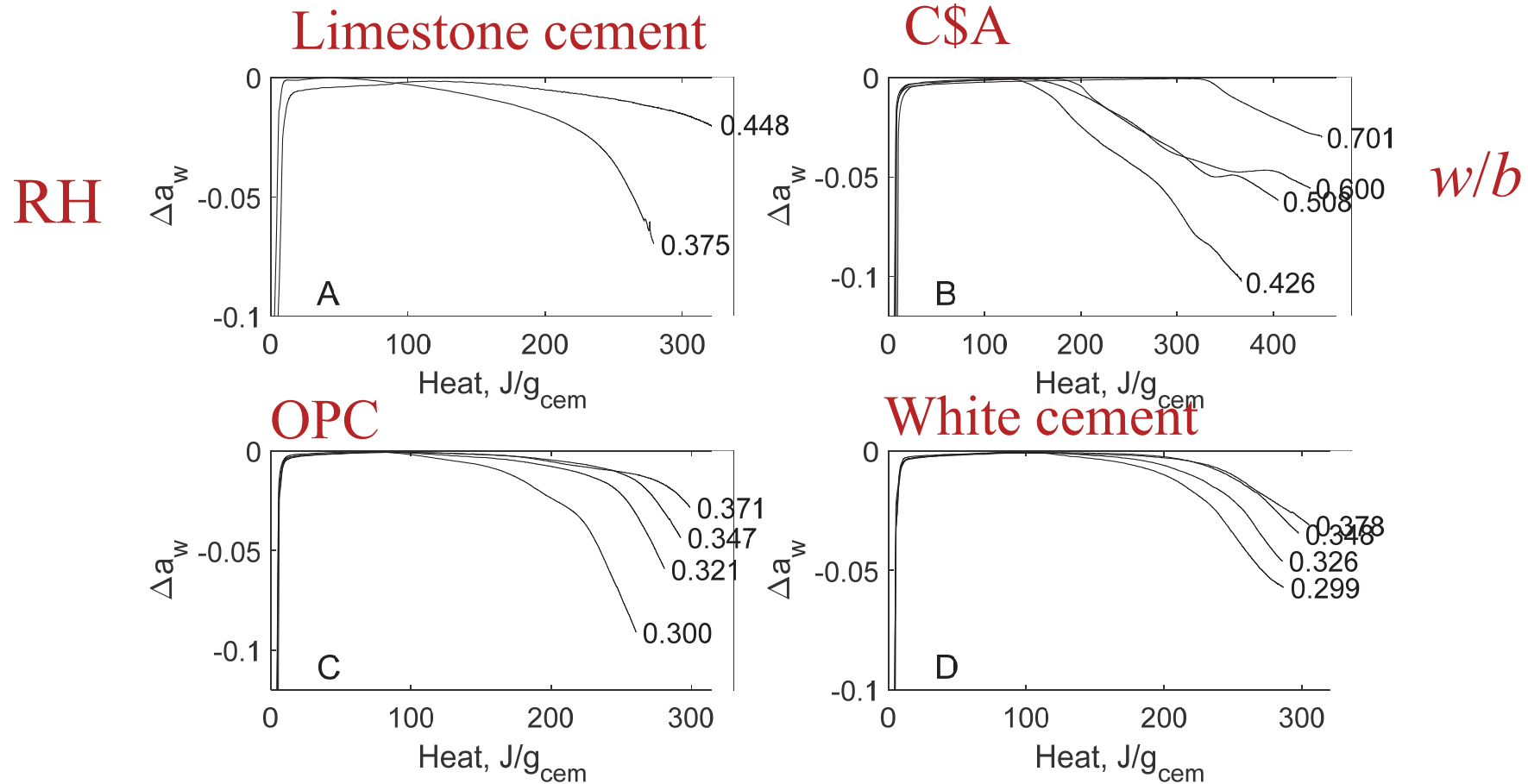


CEM I

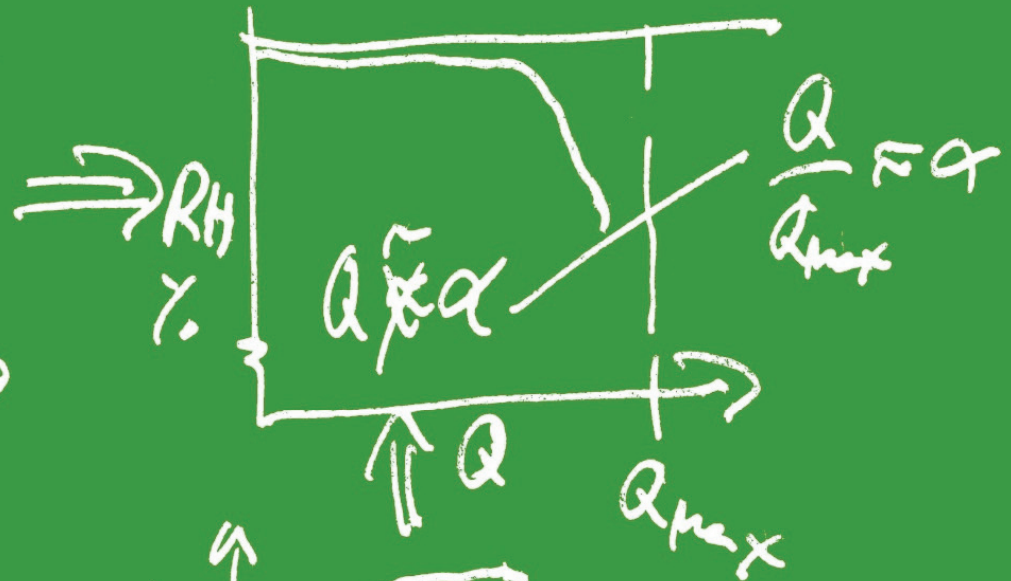
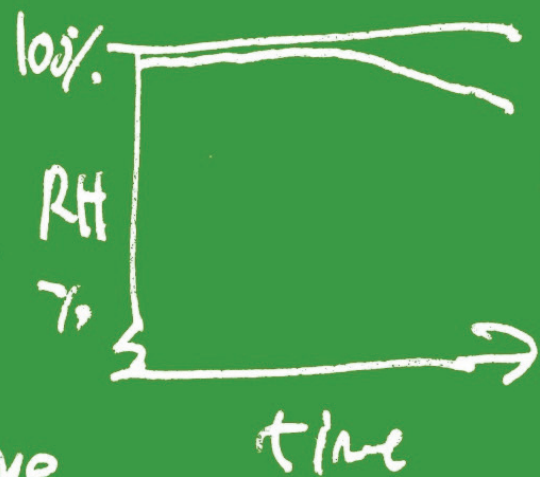
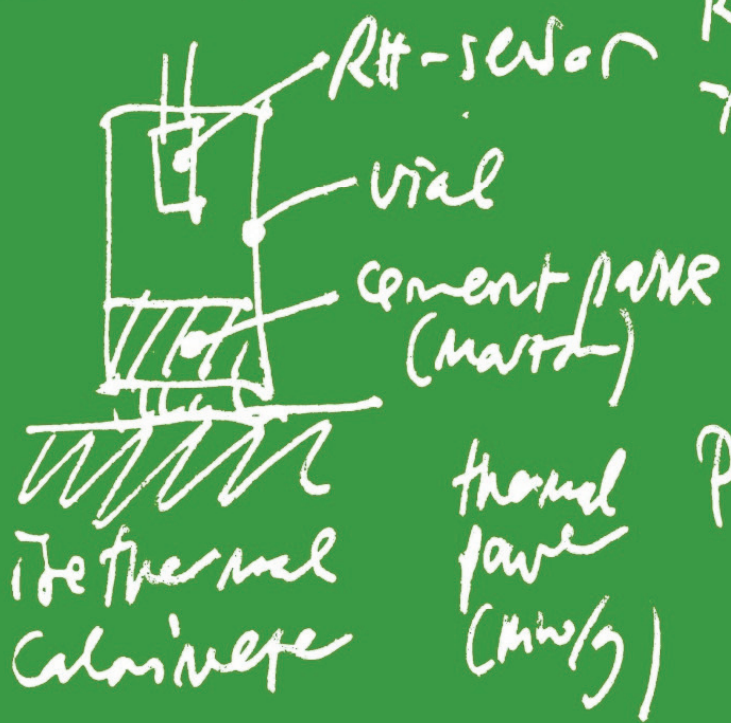
with different fly-
ash additions and
different w/c



RH as a function of degree of hydration (Q)



Thermal power & RH



Calibration (RH)

ref. fact solution

Note: extremely
 stress temperature

