

Hydration Behavior Of Celitement

Angela Ullrich, Krassimir Garbev, Peter Stemmermann

4th European Cement Calorimetry Conference

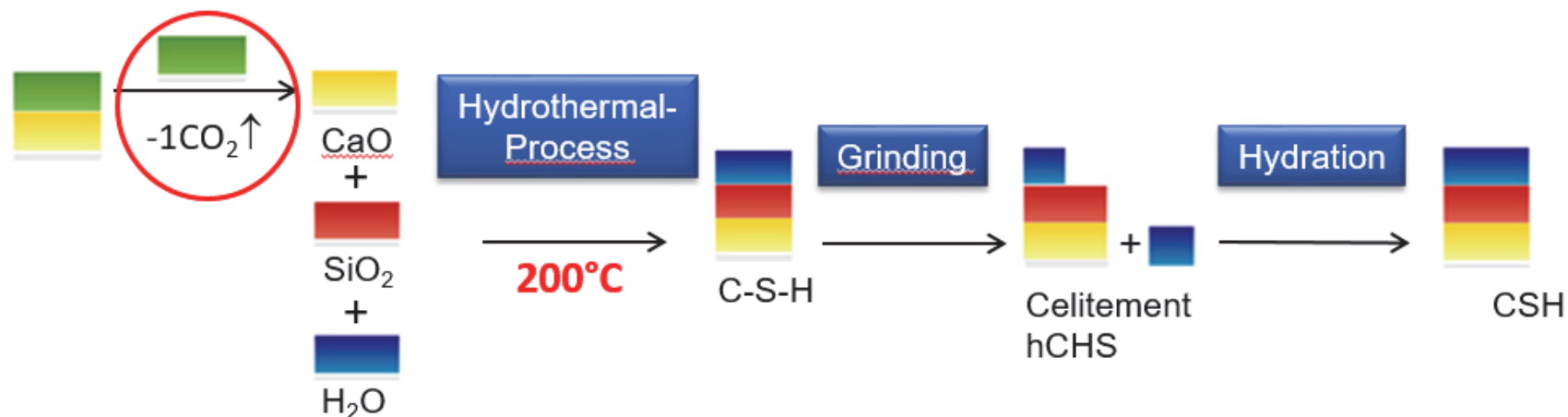


Celitement

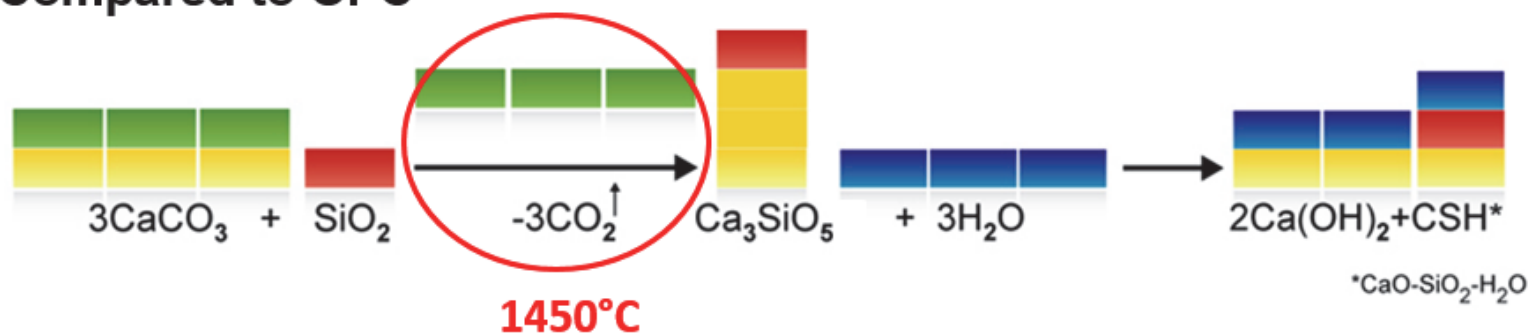
- is a spin-off of the Karlsruher Institute of Technology (KIT) in cooperation with the industry partner Schwenk
- is the brand name for a group of high-quality hydraulic binders
- is comparable to Portland cement (OPC) in applicability and durability
- is based on the same raw materials as OPC
- is a pure CSH-binder with a dense microstructure
- is produced by an innovative combination of a hydrothermal process with subsequent grinding where the hydraulic binder forms



Production and Hydration of Celitement

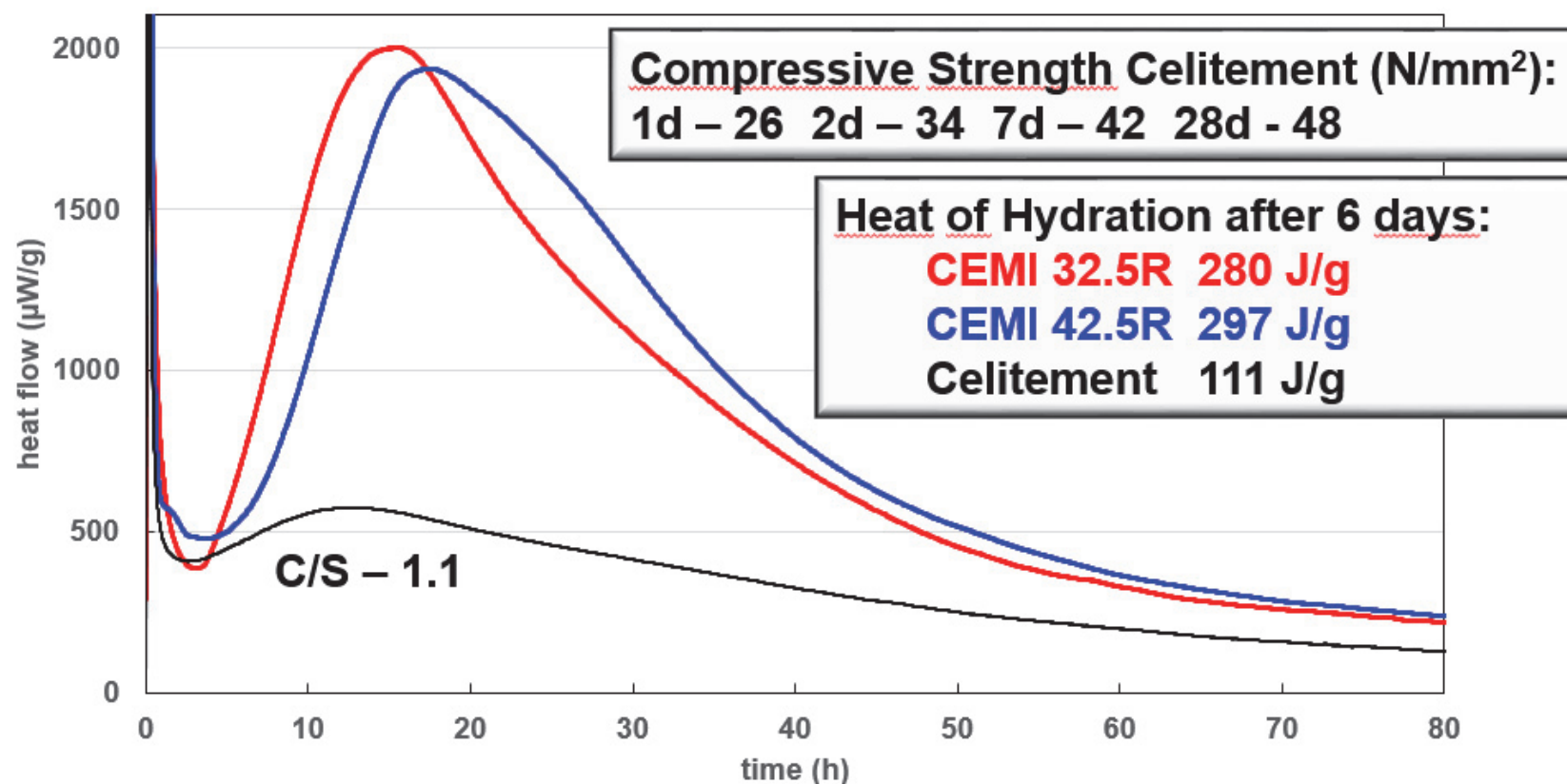


Compared to OPC



→ What impact has the absence of Portlandite (CH) in the hydration process?

Heat Flow for Celitement and OPC



→ Low heat of hydration due to less solution of Ca

Measurement Conditions

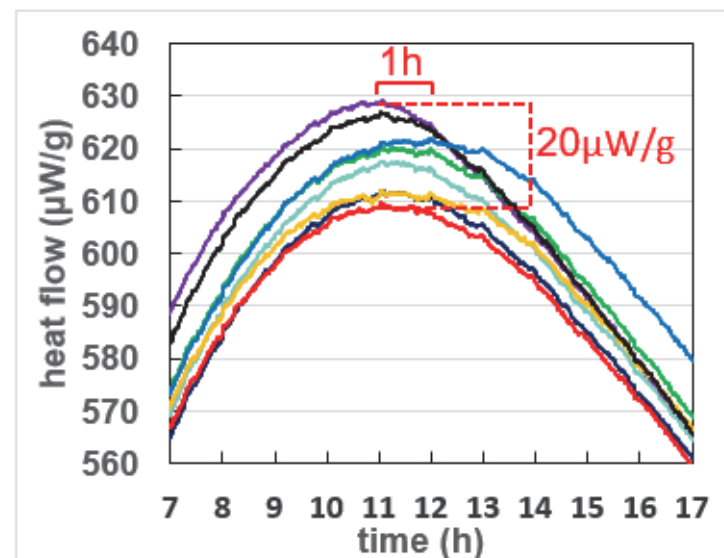


TAM Air 8-channels with 20ml Admix glass ampoules and syringes for water injection

1g Sample + 1g H₂O
water demand Celitement:
w/c-0.4

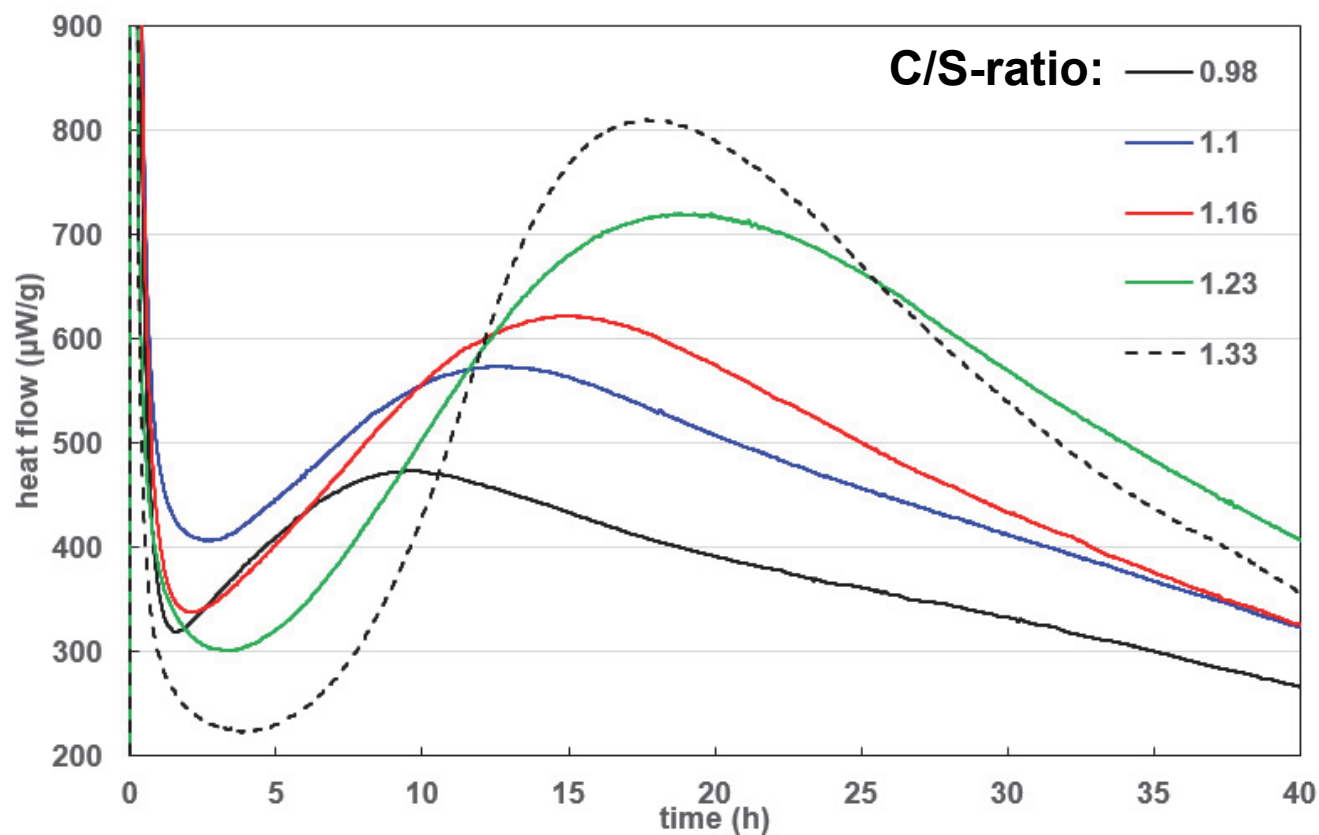
➤ **No stirring required**

Subtraction of initial
background



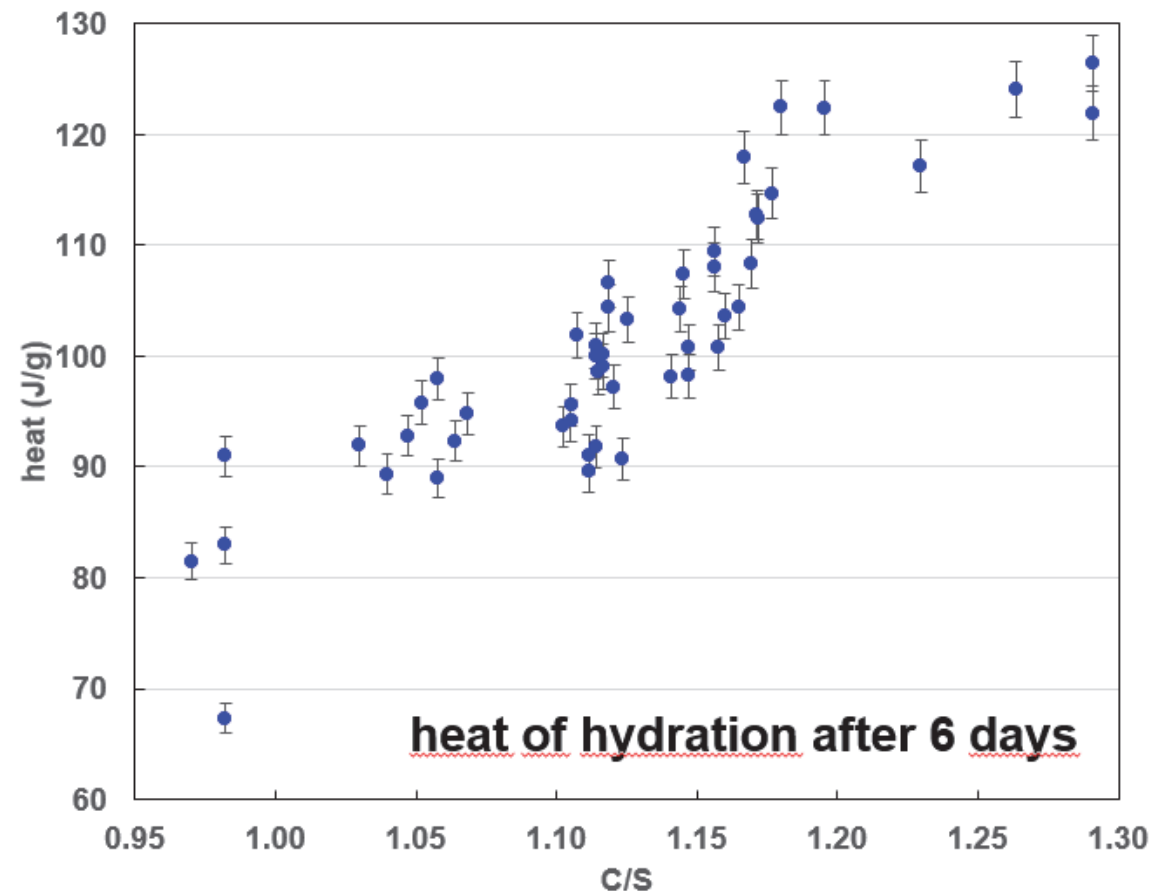
→ **Deviation in heat of hydration due to sample inhomogeneity and measurement: ±2%**

Influence of C/S-ratio on the Heat Flow



→ Is there an increase in cumulative heat with C/S?

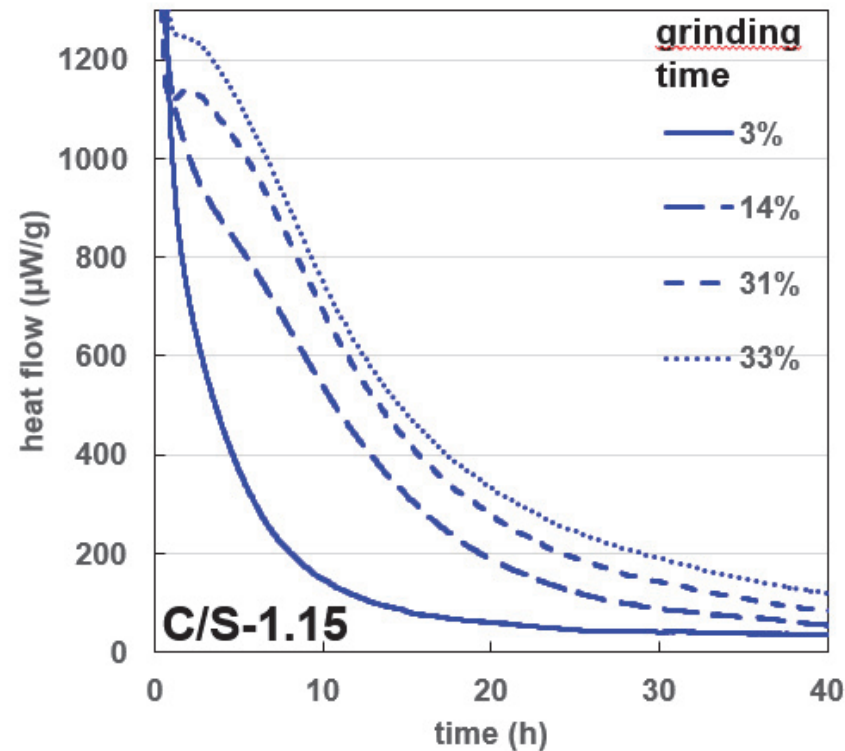
Influence of C/S-ratio on the Heat of Hydration



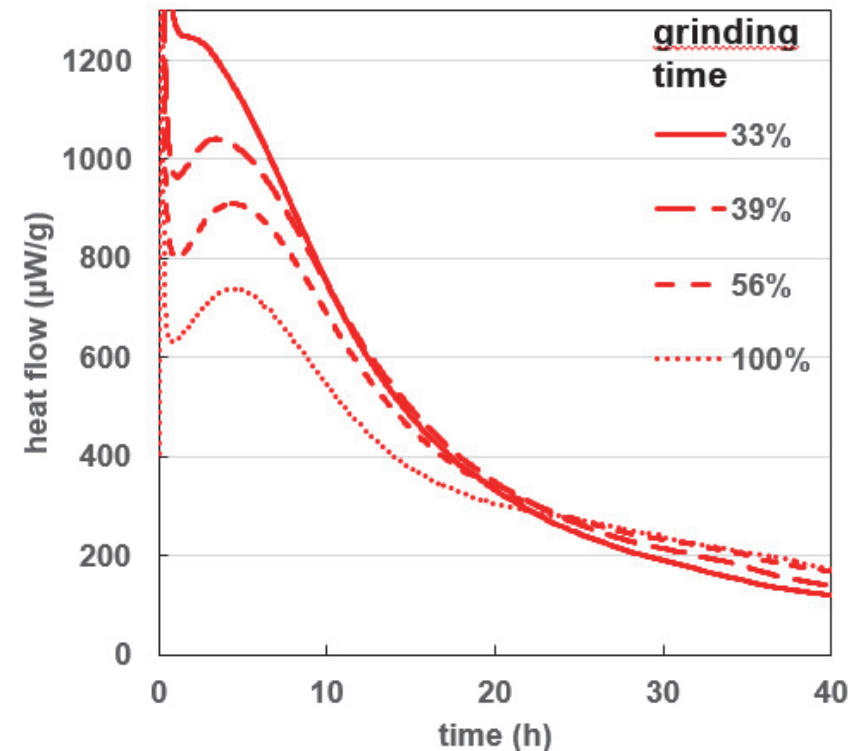
➤ Heat ~ Enthalpy
of Ca solution
hence no
straight
dependency on
C/S

→ What parameters control the reactivity of the binder?

Influence of Grinding Time on the Heat Flow

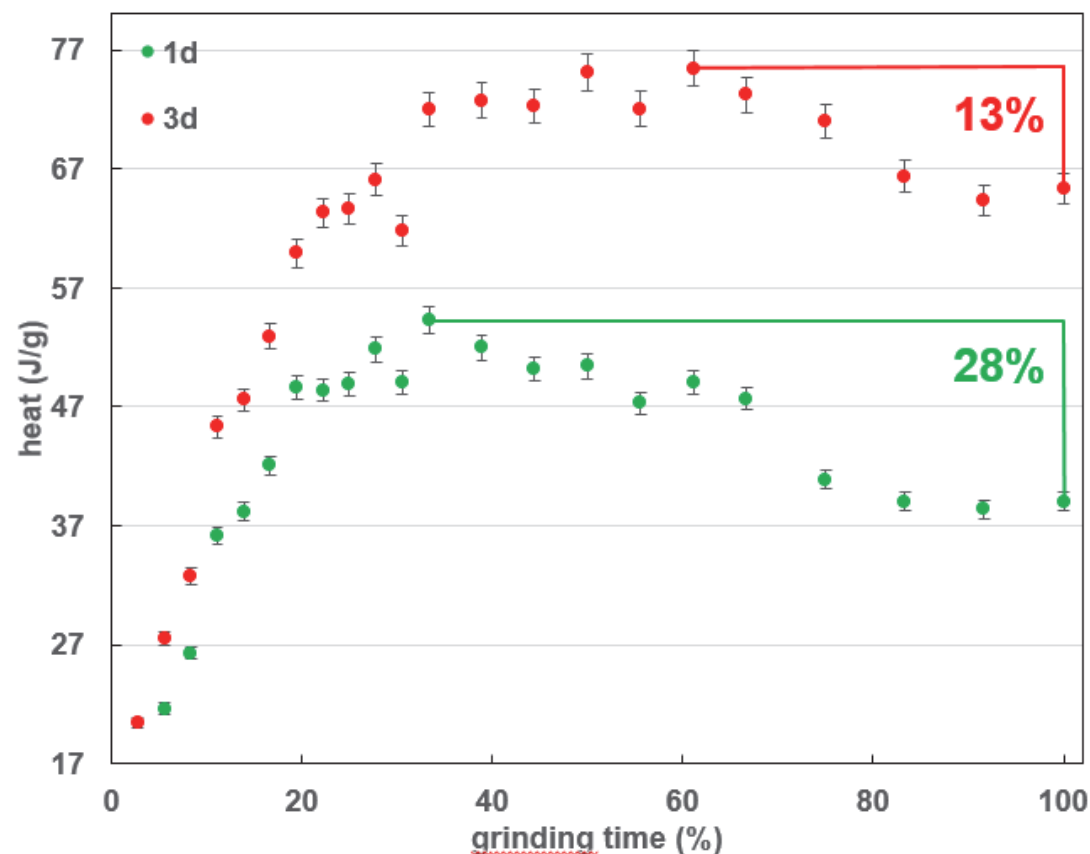


100% grinding time = Standard



→ Is there a decrease in cumulative heat with overgrinding?

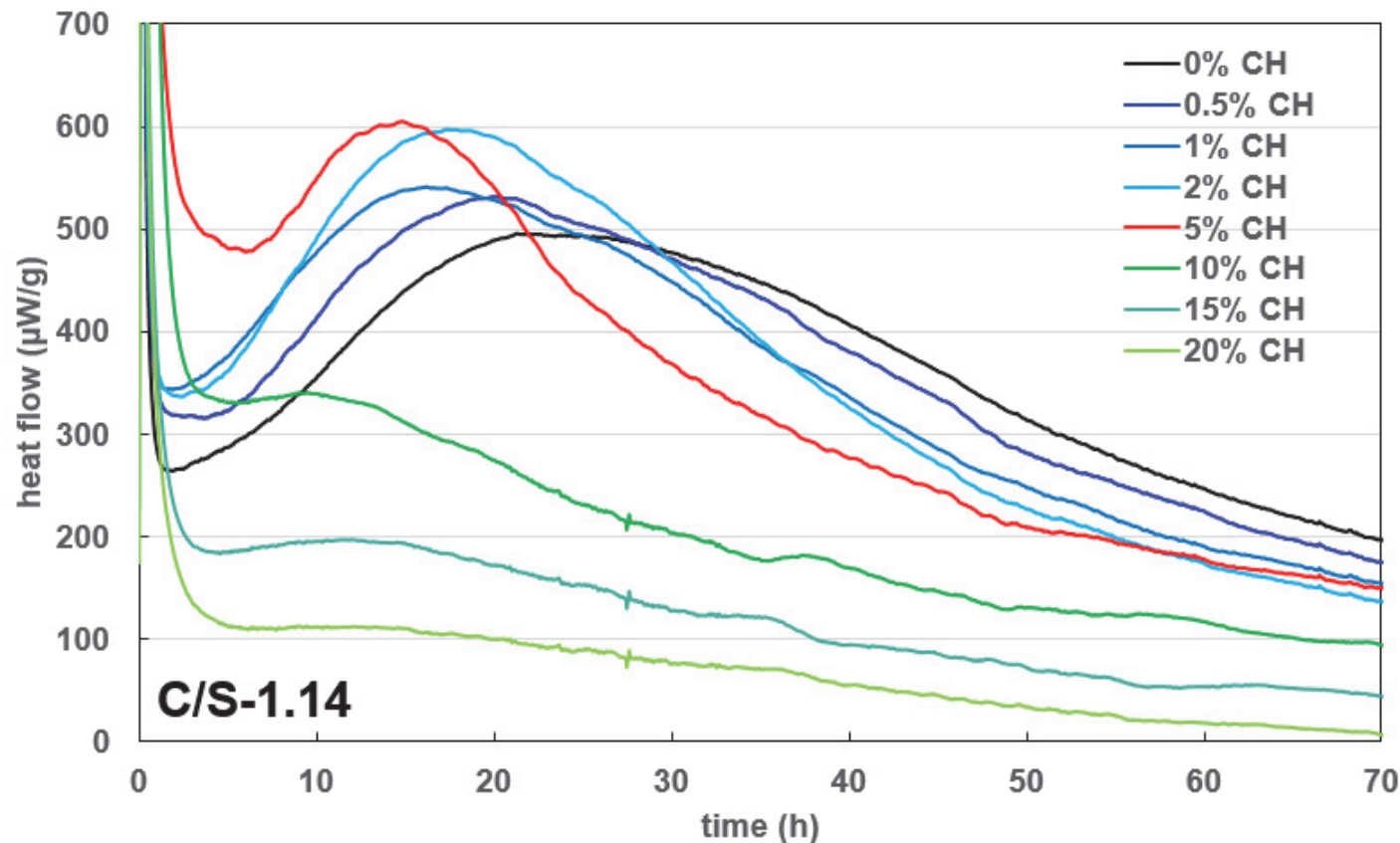
Influence of Grinding Time on the HoH



➤ Difference in kinetics, not in the amount of Ca that is available for solution

→ How does the addition of reactive Ca affect the kinetics?

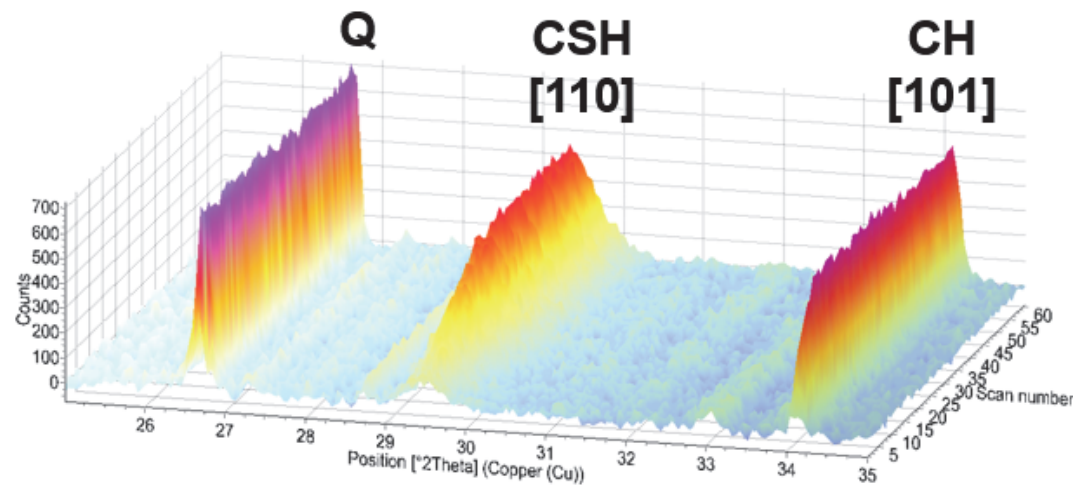
Co-grinding of Celitement with CH



→ What are the differences in solution-precipitation mechanisms in samples with addition of 5 and 10% CH?

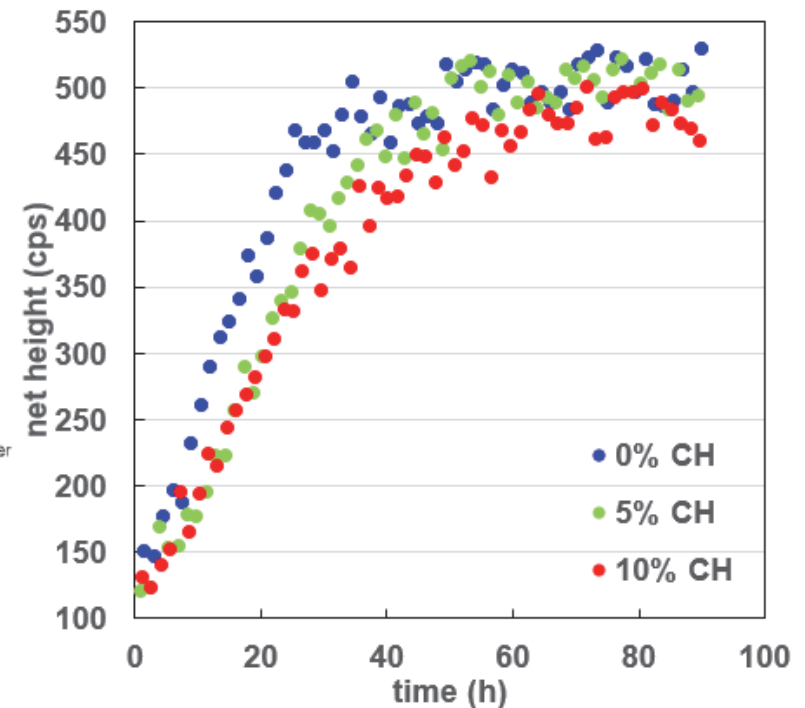
Co-grinding of Celitement with CH

5% CH



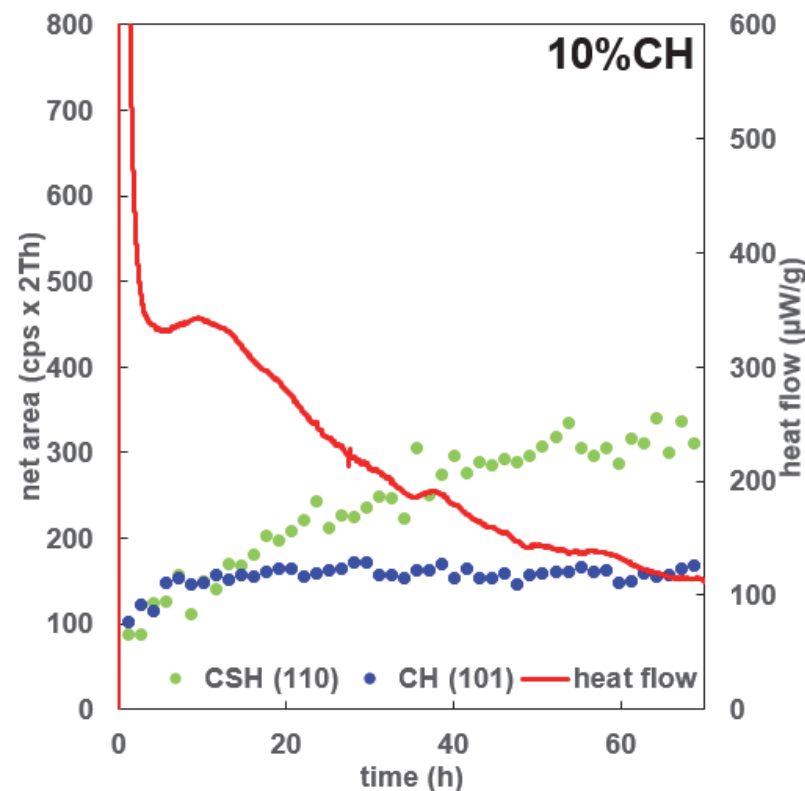
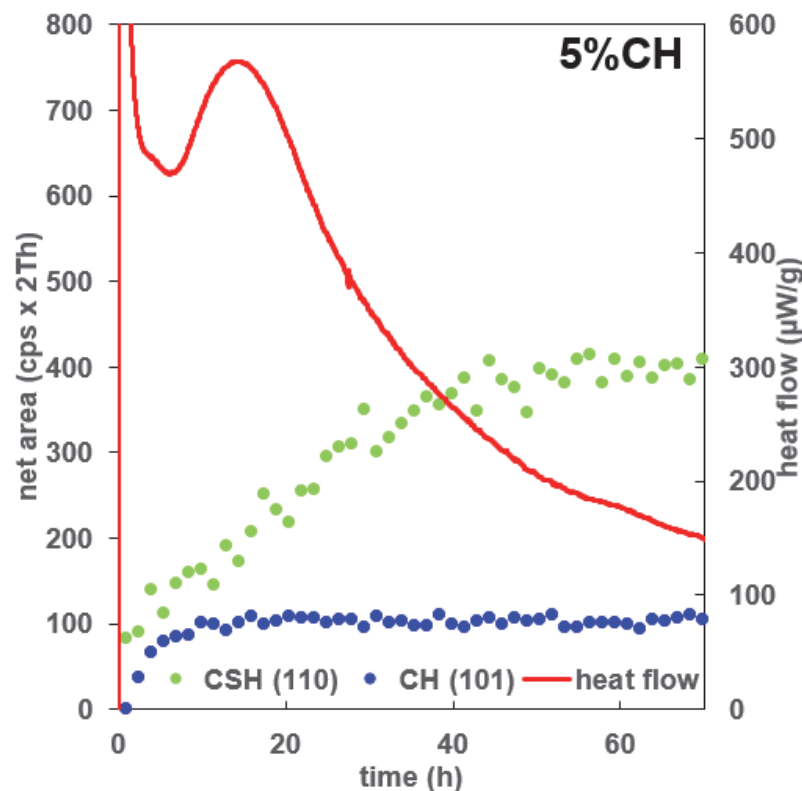
w/c-0.4

CSH [110]



→ Is the formation of CSH terminated after 40h of hydration?

Co-grinding of Celitement with CH



→ High amount of Ca dissolution from CH results in the formation of a passivation layer of CSH on hCHS

Calorimetry on Celitement...

- is challenging because binders with low C/S-ratio produce low cumulative Heat of Hydration
- can only provide information on the kinetics of the Hydration but not on the material properties
- with addition of CH proves that the hydration behavior of binders with low Ca-content strongly depends on the pH