

New chapter in the Danish concrete handbook

Alkali aktiveret beton

Marvin Glissner
24.02.2026



Marvin Glissner

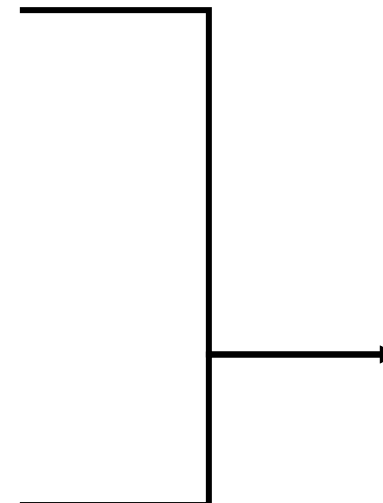
PhD student (until recently)

Topic: Portland cement free concrete



Ole Mejlhede Jensen

Professor at DTU



12.11 Alkali-aktiveret beton

Betonhåndbogen
Kapitel 12: Beton
i bygge- og
anlægsbranchen

Udgivet af
Dansk Betonforening
23.02.2026
Version 1.0

Figurer og tabeller
Alle figurer og
tabeller tilhører
Dansk Betonforening,
medmindre andet er
angivet. Forsidefoto:
blu – Gesellschaft
für nachhaltige
Immobilienprojekte
mbH & AUG. PRIEN
Bauunternehmung
GmbH & Co. KG.

Forfattere
Marvin Glissner
Ole Mejlhede Jensen



Where to find the chapter

☐	12 Beton i bygge- og anlægsbranchen		^
☐	12.1 - Fabriksbeton (21 sider)	Sidst rev.: 17-03-2019	
☐	12.2 - Betonelementer (27 sider)	Sidst rev.: 19-03-2019	
☐	12.3 - Belægninger (10 sider)	Sidst rev.: 28-11-2013	
☐	12.4.1 - Letklinkerblokke (10 sider)	Sidst rev.: 29-11-2013	
☐	12.4.2 - Udstøbningsblokke (5 sider)	Sidst rev.: 29-11-2013	
☐	12.5 - Rør, brønde og bygværker (14 sider)	Sidst rev.: 29-11-2013	
☐	12.9.7D - Betonprint (17 sider)	Sidst rev.: 17-01-2024	
☒	12.11 - Alkali aktiveret beton (27 sider)	Sidst rev.: 23-02-2026	

1. Overview
2. Introduction
3. **Precursor**
 1. **High calcium binder systems**
 2. **Low calcium binder systems**
4. **Activator**
5. **Fresh material properties**
6. Hardening material properties
 1. **Strength and elastic modulus**
 2. Creep
 3. Heat of hydration
 4. Shrinkage
 1. Drying shrinkage
 2. Chemical shrinkage
 3. **Autogenous shrinkage**
7. Crack risk
8. **Durability**
 1. **General**
 2. Chloride resistance
 3. Alkali silica reaction
 4. Sulphate and acid resistance
 5. Freeze thaw resistance
9. **Standards and testing**
10. Literature

What is Alkali activated material (AAM)



Aluminosilicate Powder



Activator

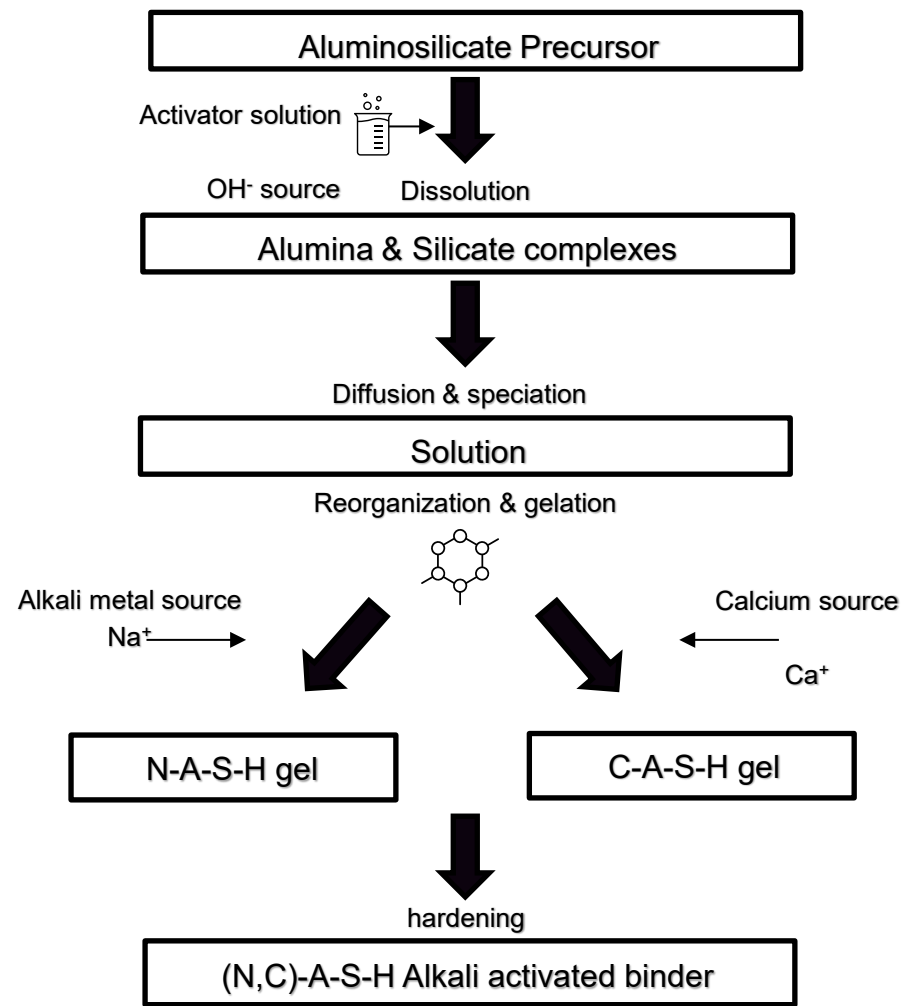


Water



AAM paste

Alkali activated concrete

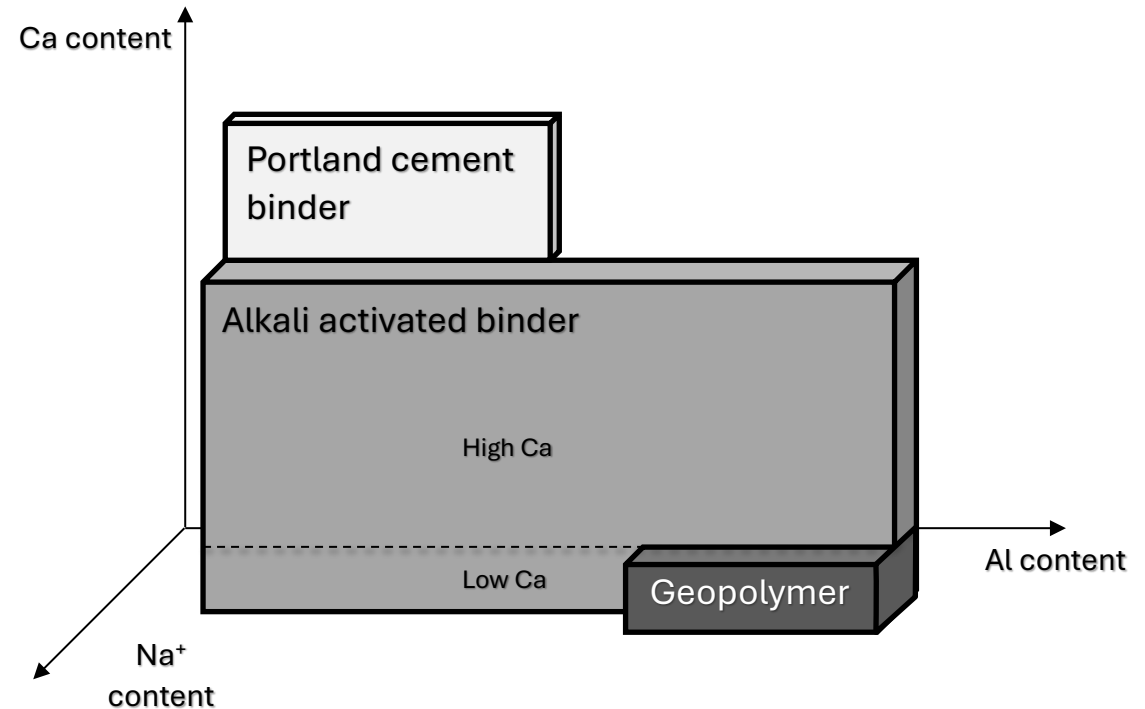


Precursors define the binder

Examples:

- High-Ca: GGBS, Class C fly ash
- Low-Ca: Calcined clay, Class F fly ash

Precursor composition controls properties



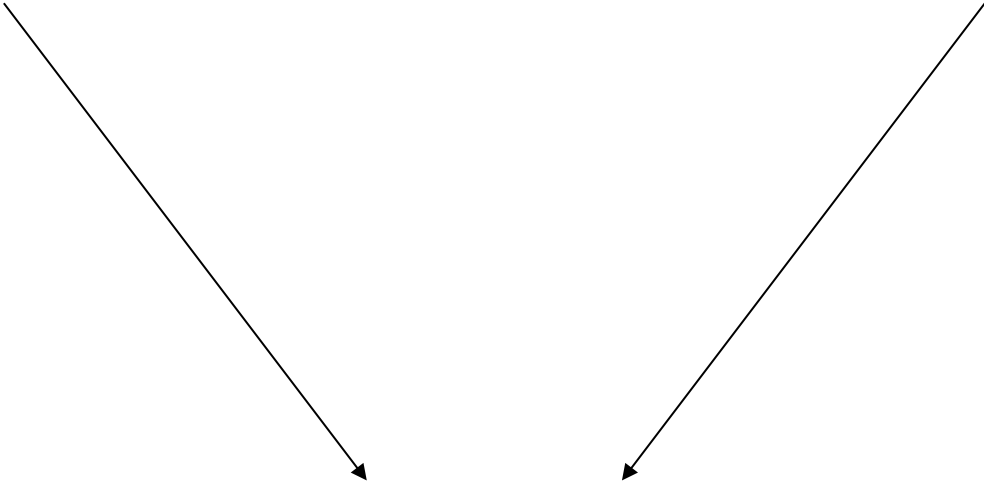
Alkali activated concrete

High-calcium:

- Faster strength development
- Ambient curing possible

Low-calcium:

- Slower reaction
- Often require heat curing

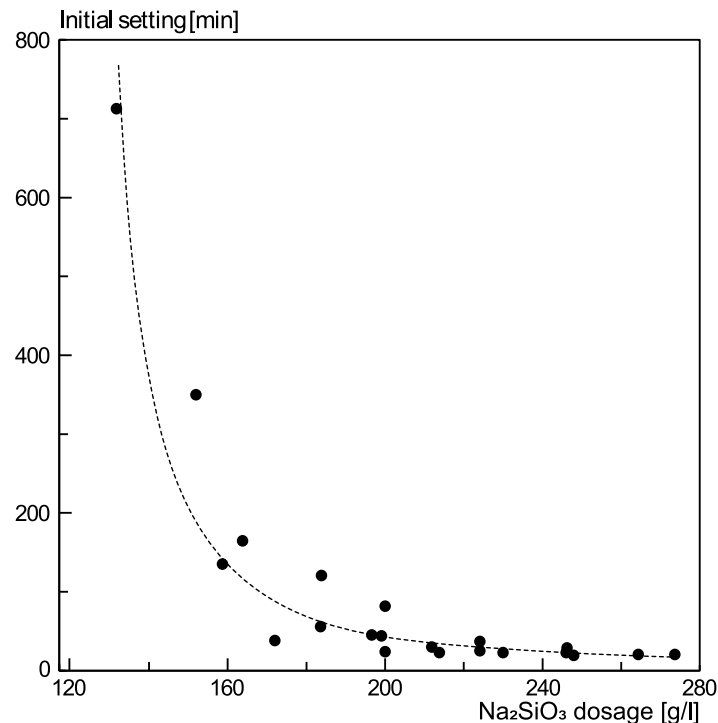


Hybrid systems possible

- Workability and Production methods **can** be similar to OPC concrete
- Setting may be very fast
- Activator influences rheology
- Admixture compatibility different

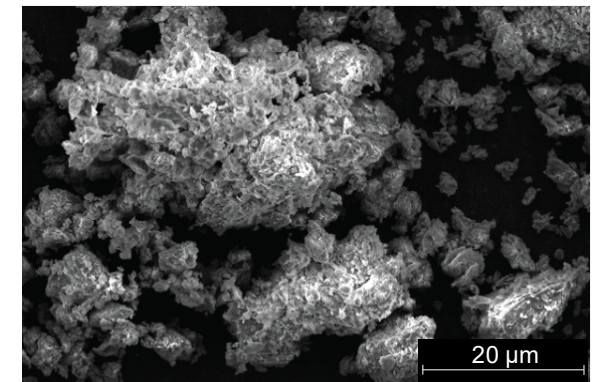
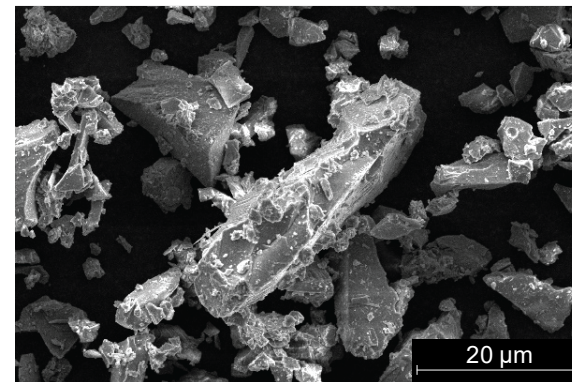
Know your mix !

Blaine



~3.200 cm²/kg

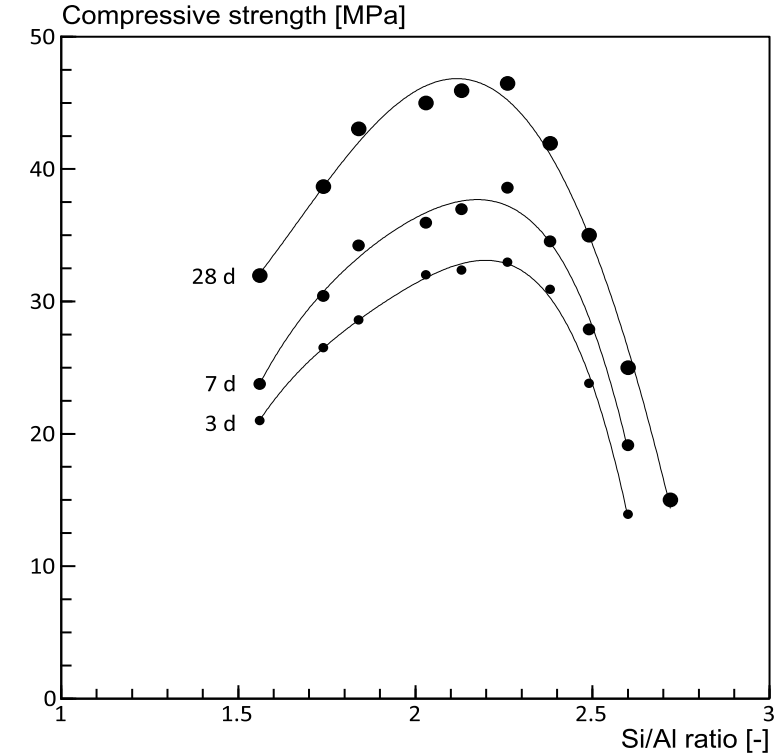
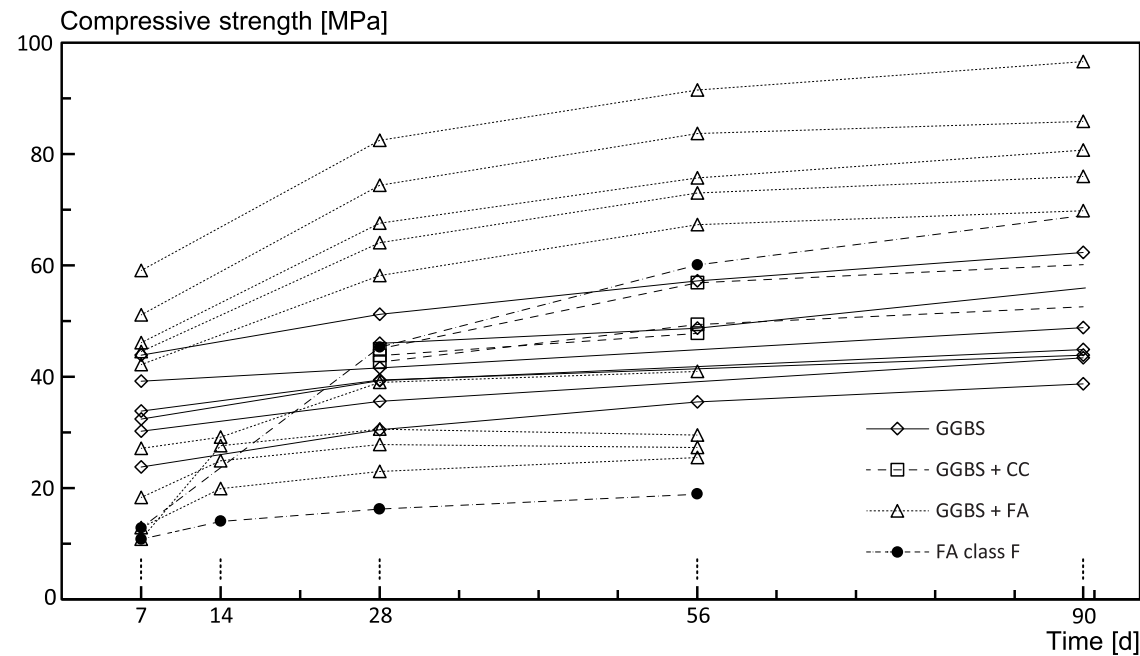
~12.000 cm²/kg



Mechanical properties

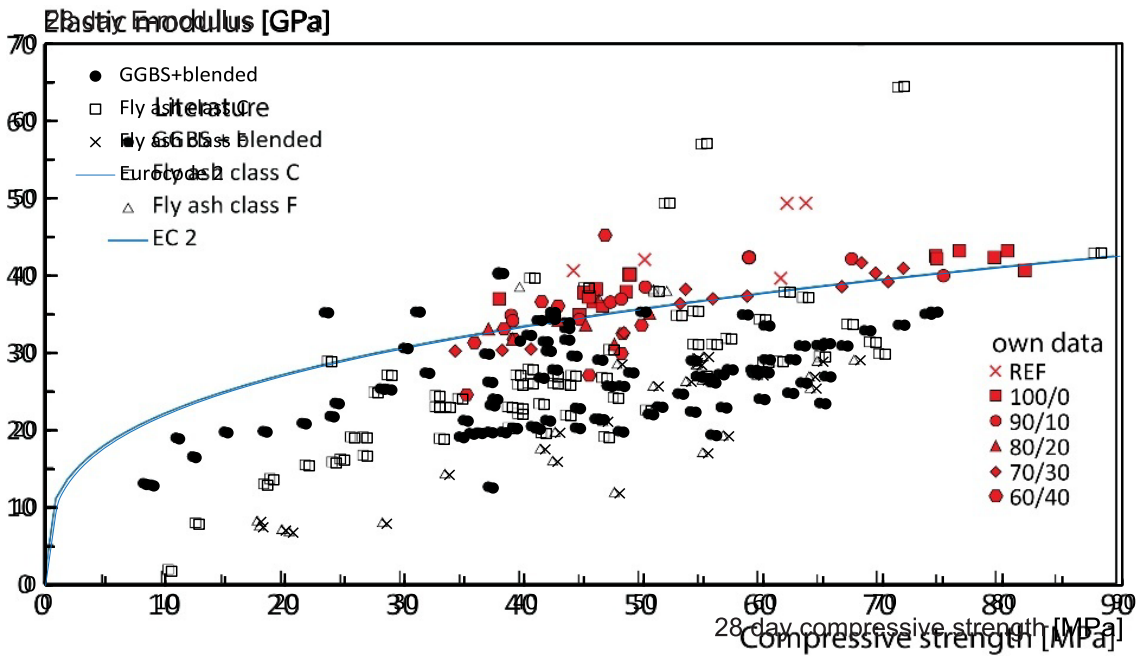
Compressive strength:

- Comparable to OPC
- Wide strength range possible



Elastic modulus:

- Typically slightly lower than OPC



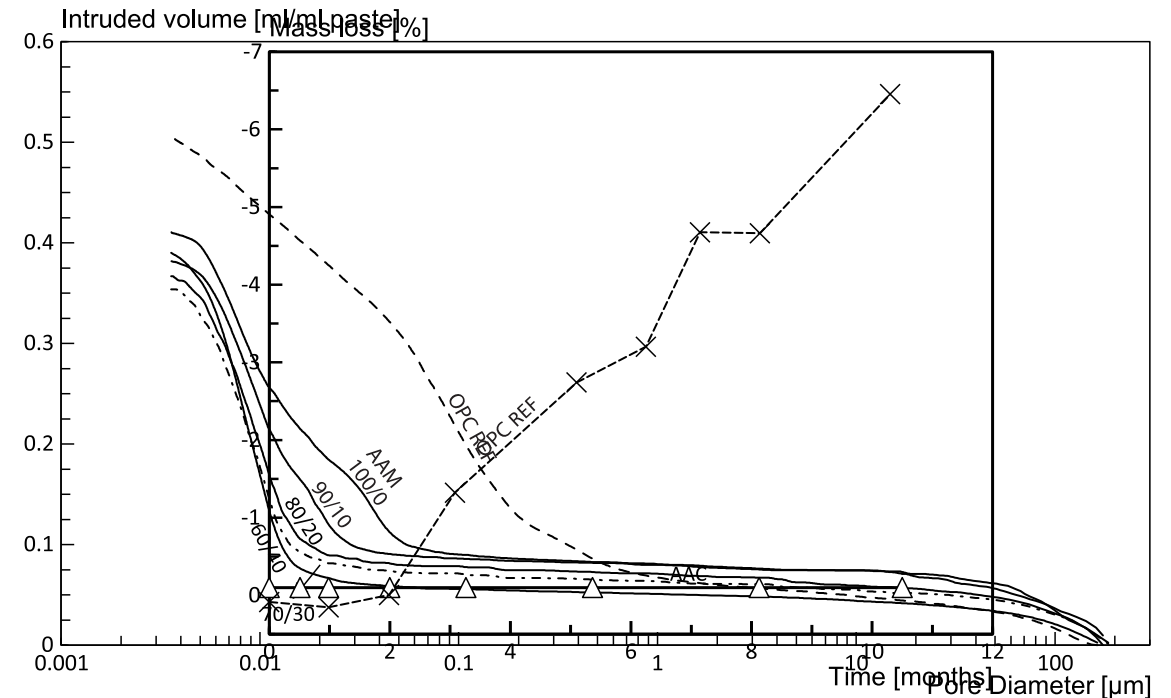
Durability often reported to be very good

Generally improved resistance:

- Chlorides
- Sulfates
- Acids
- Carbonation

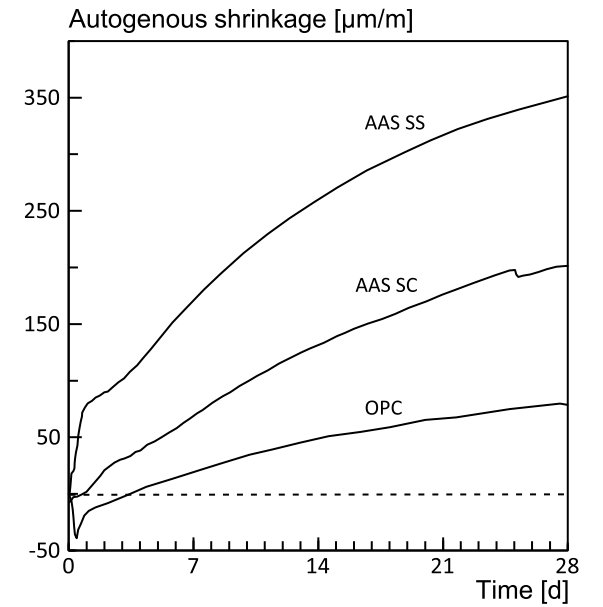
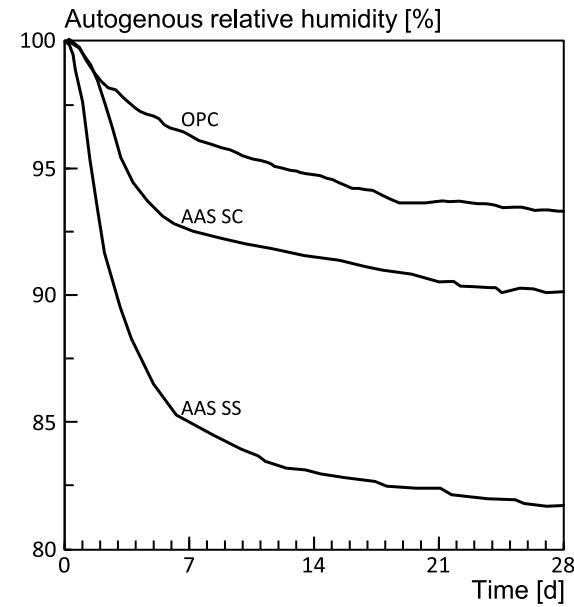
Reason:

- Dense microstructure



Shrinkage

- Typically large autogenous shrinkage
- large internal RH drops



Challenges and potentials

Main limitations:

- No international structural standard
- Little long-term experience

However:

- Strong sustainability potential
- Increasing industrial interest
- National standards emerging
- Final message:

AAC is promising but requires further validation

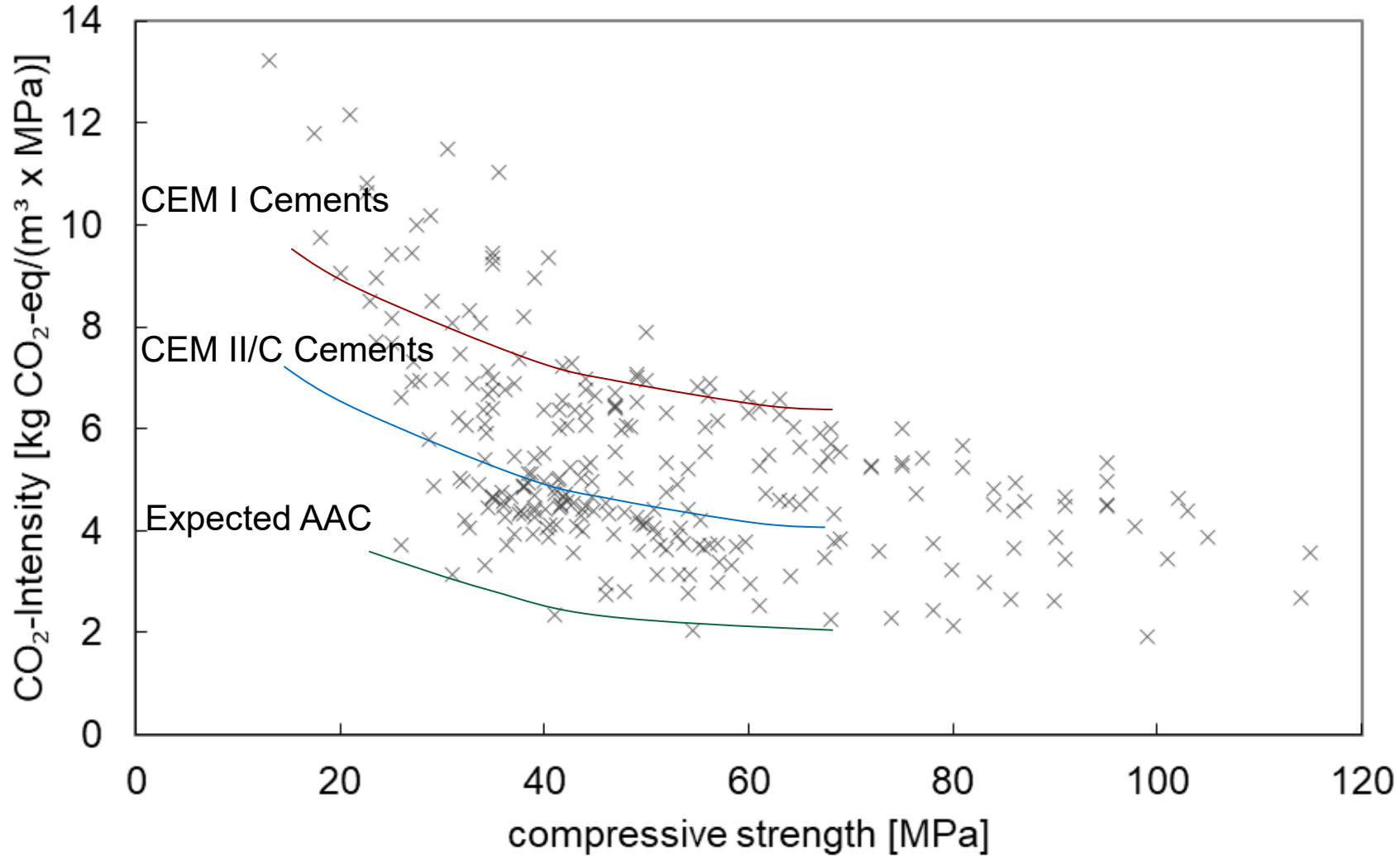
Thank you for your attention !

QUESTIONS ?

Feel free to contact me on LinkedIn



Expected CO₂



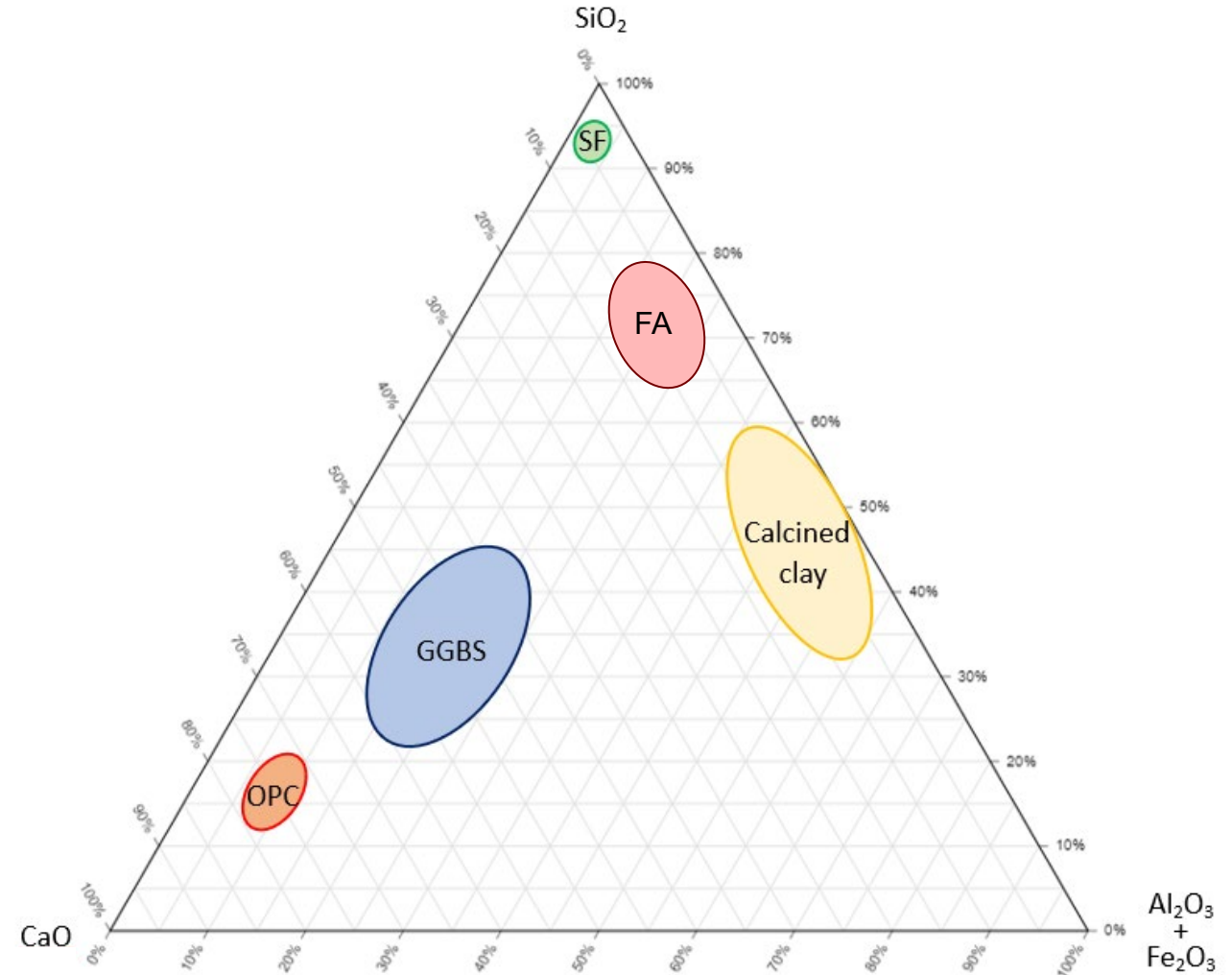
Modified from: M. Schneider, CCR, 124, 2019

Examples

- Slag - GGBS
- Fly ash - FA
- Calcined clay – CC
- Silica fume - SF

Reaction products

- Like OPC products



Applications

- Tunnel linings
- Precast elements
- Sewer pipes
- Buildings



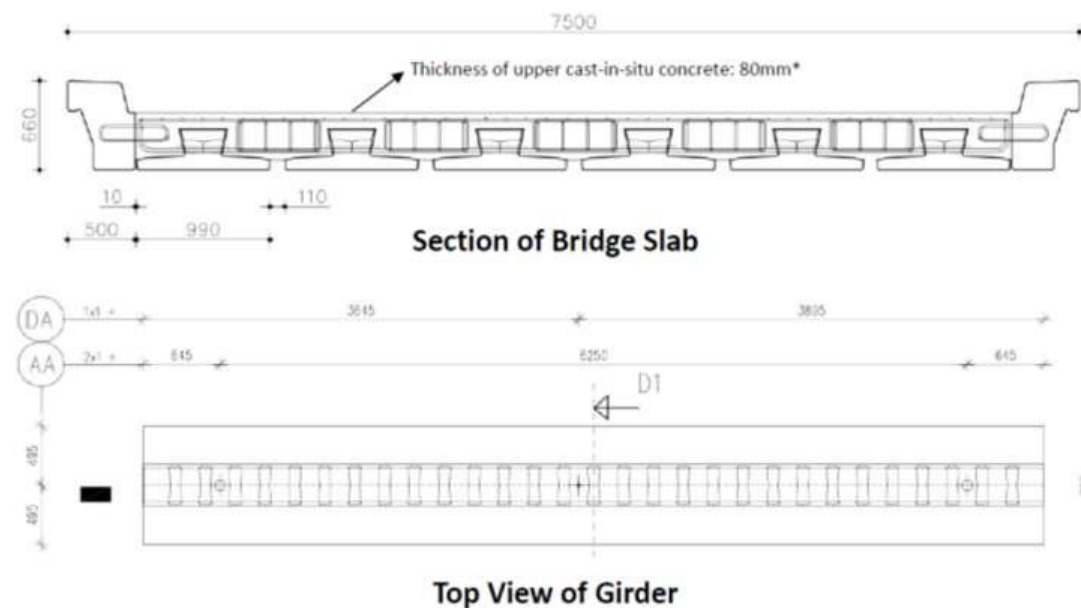
Webpage: <https://sqape.nl/en/>

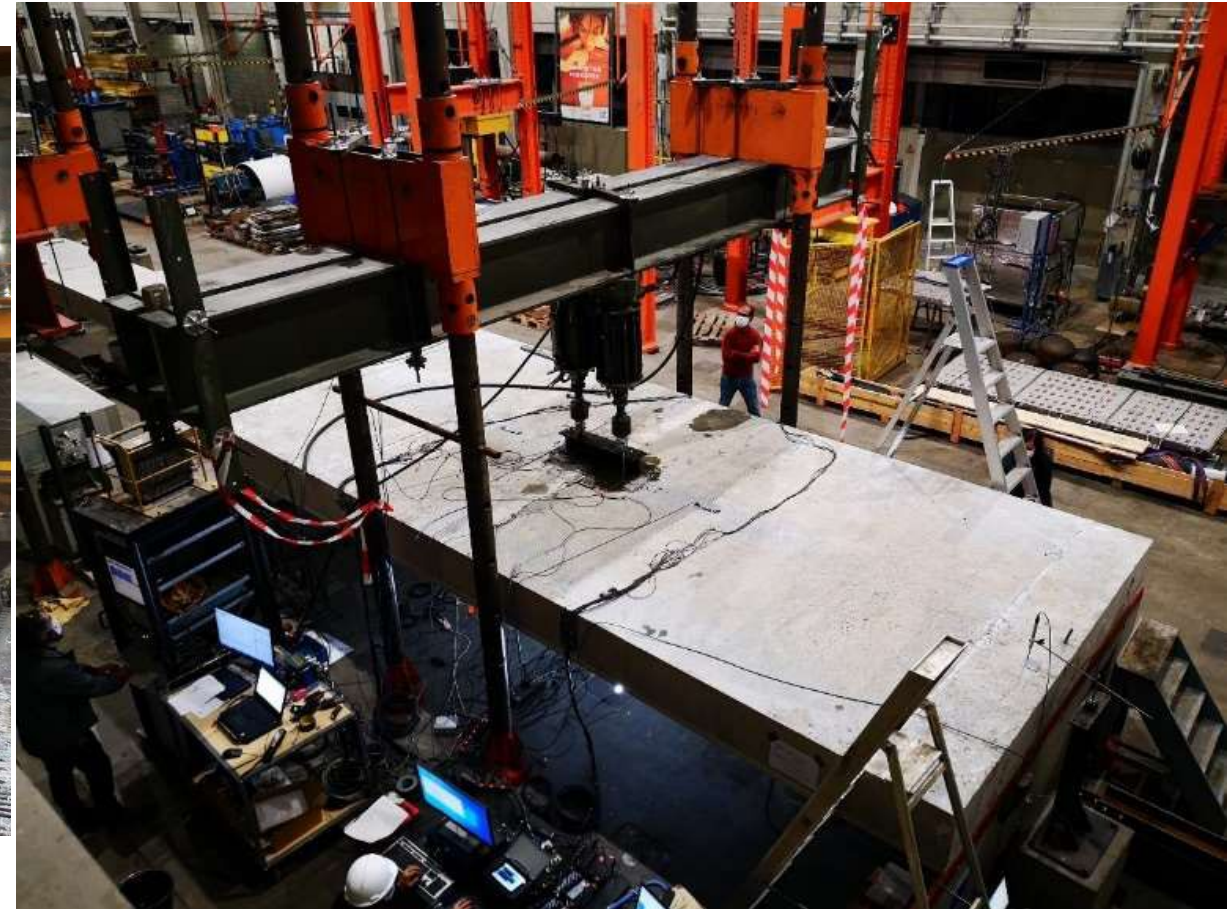


Kowebrêge, N358 Road in Friesland Province

Alkali Activated Concrete: From Design and Materials Properties to Structural Behavior and Engineering Application

“Applications by Dr. Vilma Ducman & Prof. Dr. Guang Ye & Dr. Majjda Pavlin, ZAG, TU Delft May 2025







IBF A/S: Geoprime® solution used in sewage pipes in Denmark saves over 50% CO2





next beton

Kontaktieren Sie uns

MENÜ



100% ZEMENTFREI
MADE IN GERMANY



Bis zu
70%
weniger CO₂



XA3
konform



100%
zementfrei



