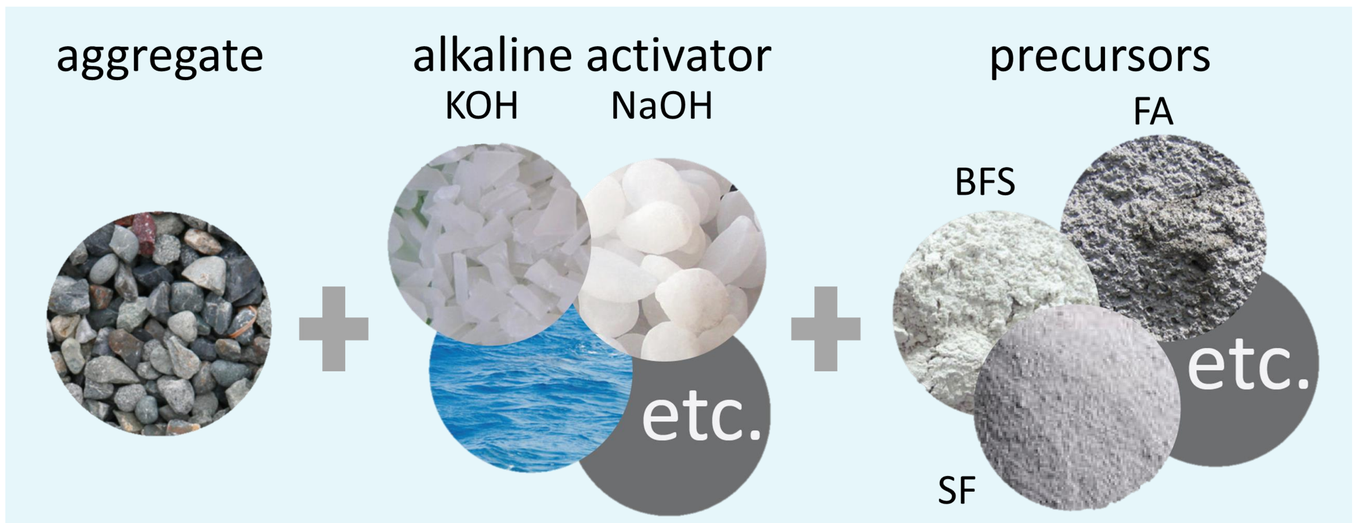
Characterization and Modeling of Flexural and Cracking Behavior of Reinforced Alkali-activated Concrete Beams

■ Background

Manufacturing of OPC results in an **enormous impact on the environment** associated with CO_2 emission

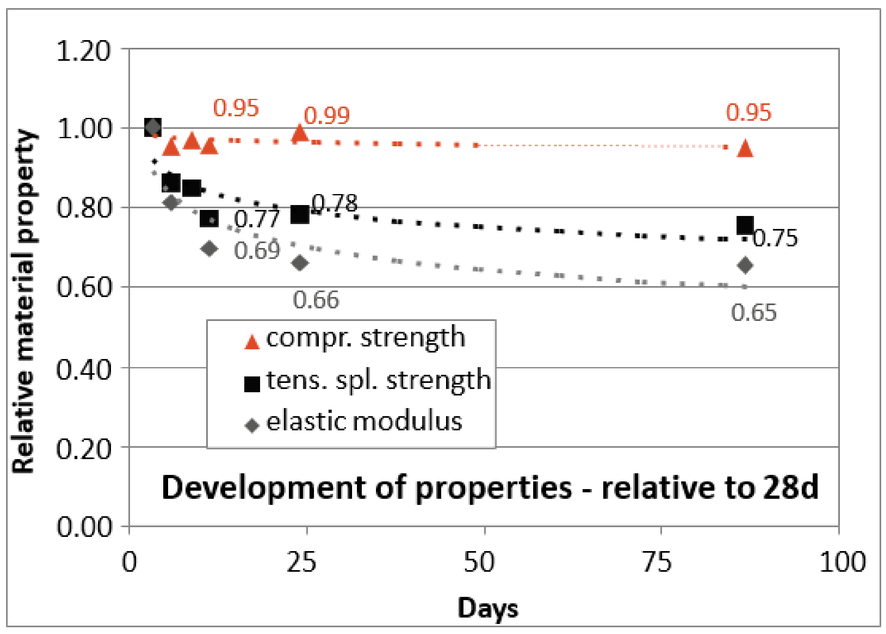


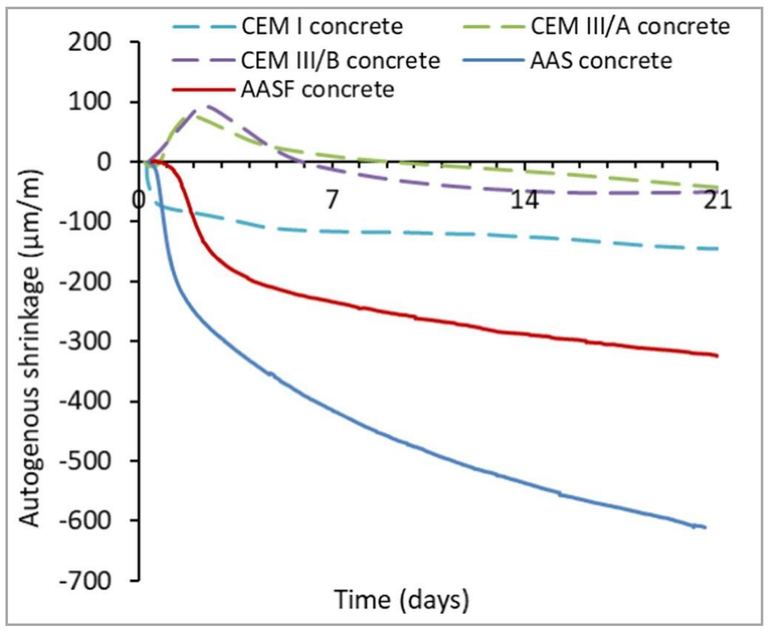
Alkali-activated concrete (AAC)

Sustainable alternative to OPC concrete

- low carbon footprint, lower production cost
- better chemical resistance
- good mechanical behavior
- high temperature resistance

■ Limitations





Limited scientific research

Decrease of mechanical properties[1]

Higher shrinkage than OPCC[2]

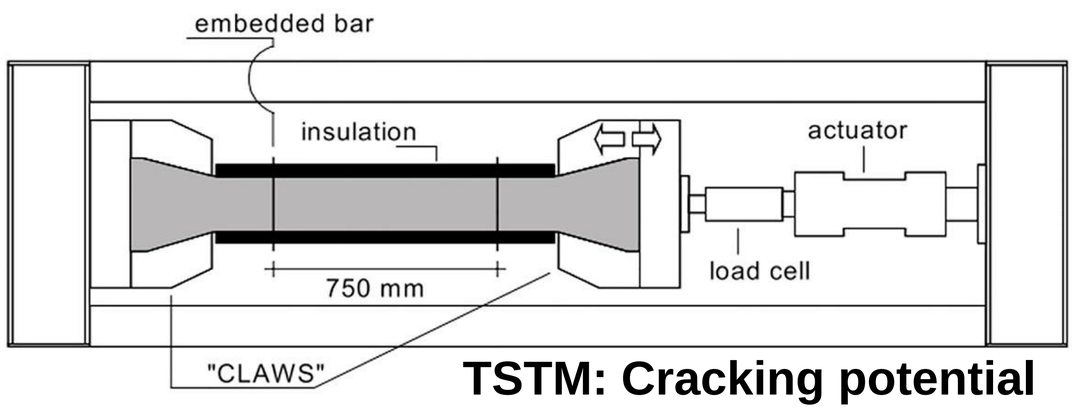
■ Objective & Methodologies

Fundamental behavior of AAC in structural applications

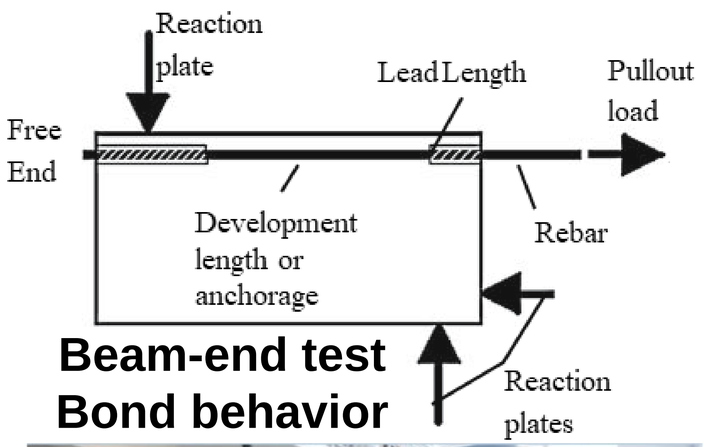
The influence of governing parameters on structural behavior

Reliable calculation models for behavior prediction

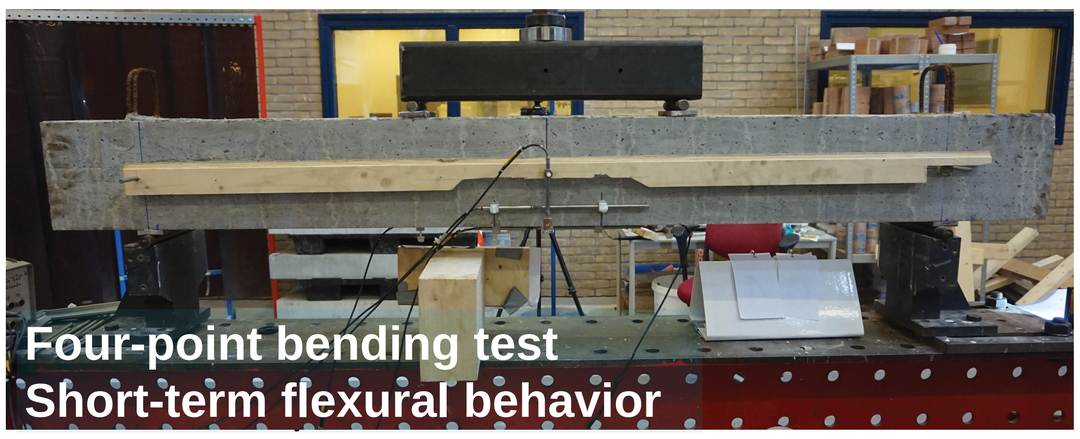
Experimental investigation



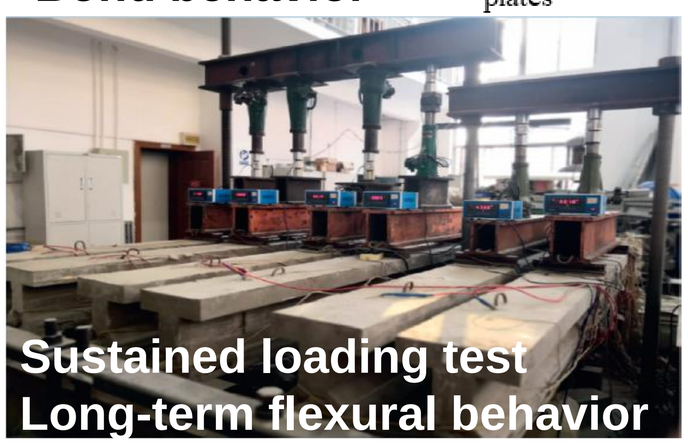
TSTM: Cracking potential



Beam-end test
Bond behavior

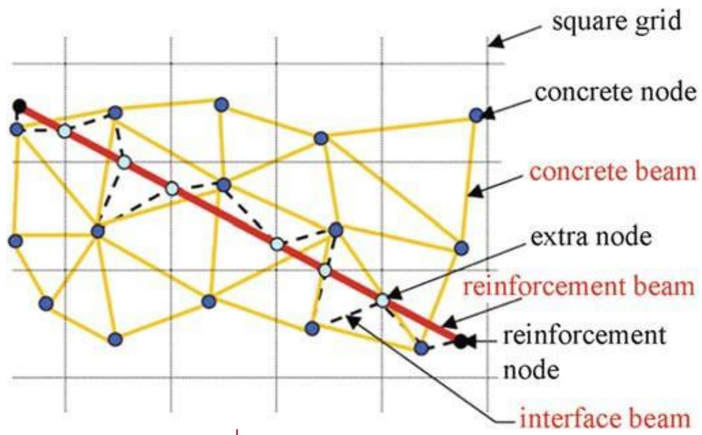


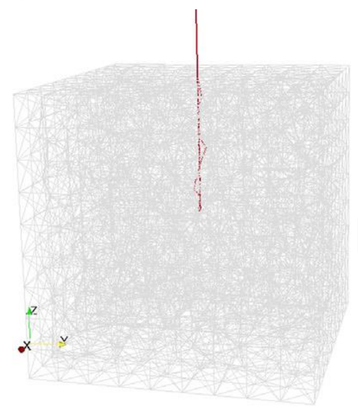
Four-point bending test
Short-term flexural behavior



Sustained loading test
Long-term flexural behavior

Numerical simulation





Extended lattice model for AAC members

Ref:

[1] S. Prinsse, D.A. Hordijk, G. Ye, P. Lagendijk, M. Luković, Time-dependent material properties and reinforced beams behavior of two alkali-activated types of concrete, Struct. Concr. 21 (2020) 642–658.

[2] Z. Li, B. Delsaute, T. Lu, A. Kostiuchenko, S. Staquet, G. Ye, A comparative study on the mechanical properties, autogenous shrinkage and cracking proneness of alkali-activated concrete and ordinary Portland cement concrete, Constr. Build. Mater. 292 (2021) 123418.

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