

# Geosil<sup>®</sup> – ready to use alkali silicates for Geopolymers

16<sup>th</sup> Geopolymer Camp 2024

**Joerg Lind**  
Wöllner GmbH  
Phone +49 17 34 30 12 11  
[joerg.lind@woellner.de](mailto:joerg.lind@woellner.de)



**Matthias Weiss**  
Wöllner GmbH  
Phone +49 17 26 37 90 88  
[matthias.weiss@woellner.de](mailto:matthias.weiss@woellner.de)

A large industrial silo with the 'woellner' logo is shown in the background. In the foreground, a mechanical arm is pouring a white granular material, likely alkali silicates, into a pile. The scene is set in an industrial facility with other silos and scaffolding visible in the background.

**woellner**

- **Who we are**
- **Basic Facts about Alkali Silicates**
- **Geosil® - Silicate binders for geopolymer-based system**
- **Influence of water and how to compensate**
- **Modification of the Geopolymer rheology**

## COMPANY INTRODUCTION

A historical black and white photograph of a factory interior. A man in a cap and work clothes is using a long-handled tool to work with material on the floor. Large industrial machinery and pipes are visible in the background.

Owned by Dr. Eduard Wöllner family foundation

An aerial photograph of an industrial facility, showing several large buildings with flat roofs and surrounding infrastructure.

Founded in 1896 – more than 125 years of experience

A black and white group photograph of approximately 15-20 people, likely employees, standing in a line outdoors. They are dressed in early 20th-century attire.

Head office in Ludwigshafen / Germany

Main product groups:

- industrial silicates
- raw materials and additives for paints, plasters and construction materials
- process chemicals for industrial water circuits

Approx. 150 employees

Annual turnover approx. 70 M€

Sites in Germany & Austria

# Basic facts about alkali silicates





## Basic facts about alkali silicates

- Glasses soluble in water, consisting of a combination of alkali metal oxide ( $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ ) & silica ( $\text{SiO}_2$ ) in varying proportions
- Alkali silicates are generally not distinct stoichiometric chemical substances
- No specific chemical formula for each product
- Common name = Waterglass
- Products available as solution and powder



## Molar and weight ratio

$$\text{Molar ratio} : \frac{n \text{ SiO}_2 [\text{mol}]}{n \text{ Me}_2\text{O} [\text{mol}]} = MR [-]$$

$$\text{Weight ratio} : \frac{w \text{ SiO}_2 [\%]}{w \text{ Me}_2\text{O} [\%]} = WR [-]$$

Technical significant liquid Na, K & Li-silicates and mixtures thereof:

- Sodium silicate  $MR = 1,7 - 4,0$
- Potassium silicate  $MR = 1,0 - 4,0$
- Lithium silicate  $MR = 2,5 - 5,0$



# Geosil<sup>®</sup> - Silicate binders for geopolymer-based systems



## Geosil<sup>®</sup> - Silicate binders for geopolymeric systems

- Geosil-products are not blends of standard alkali silicates with hydroxide
- New production technology
- Highest possible solid content & optimal Q-structure distribution

### Pros




- + Ready-to-use solutions
- + Many variations are possible
- + User-friendly - no hydroxide handling
- + High purity of raw materials
- + Reproducible & controlled production process
- + Storage stable solutions

### Cons





- some specific Geosil-grades are classified as dangerous goods (ADR)
- Molar ratio  $< 1,7$  for sodium based products are not suitable due to limited shelf life / spontaneous crystallisation



## Geosil® - Types

Product	Geosil® 14515	Geosil® 14517	Geosil® 34417
Alkali metal	potassium	potassium	sodium
Viscosity [mPa·s]	Ca. 20	Ca. 20	Ca. 430
CLP - classification	H290 / H314 (1B) / H318	H315 / H318	H315 / H318
CLP - label			
ADR - classification	Class 8 / packaging group II	non	non

## Geosil® - Types

Product	Geosil® WB 10	Geosil® WB 30	Geosil® TB 10	Geosil® TB 30
Suitable for	potassium silicate	sodium Silicate	potassium silicate	sodium silicate
Viscosity [mPa·s]	Ca. 20	Ca. 170	Ca. 20	Ca. 370
CLP - classification	H315 / H318	H315 / H318	H315 / H318	H315 / H318
CLP - label				
ADR - classification	Non	non	non	non

# Influence of water and how to compensate



## Possible origin of water in the Geopolymer-mixture

- Geosil®



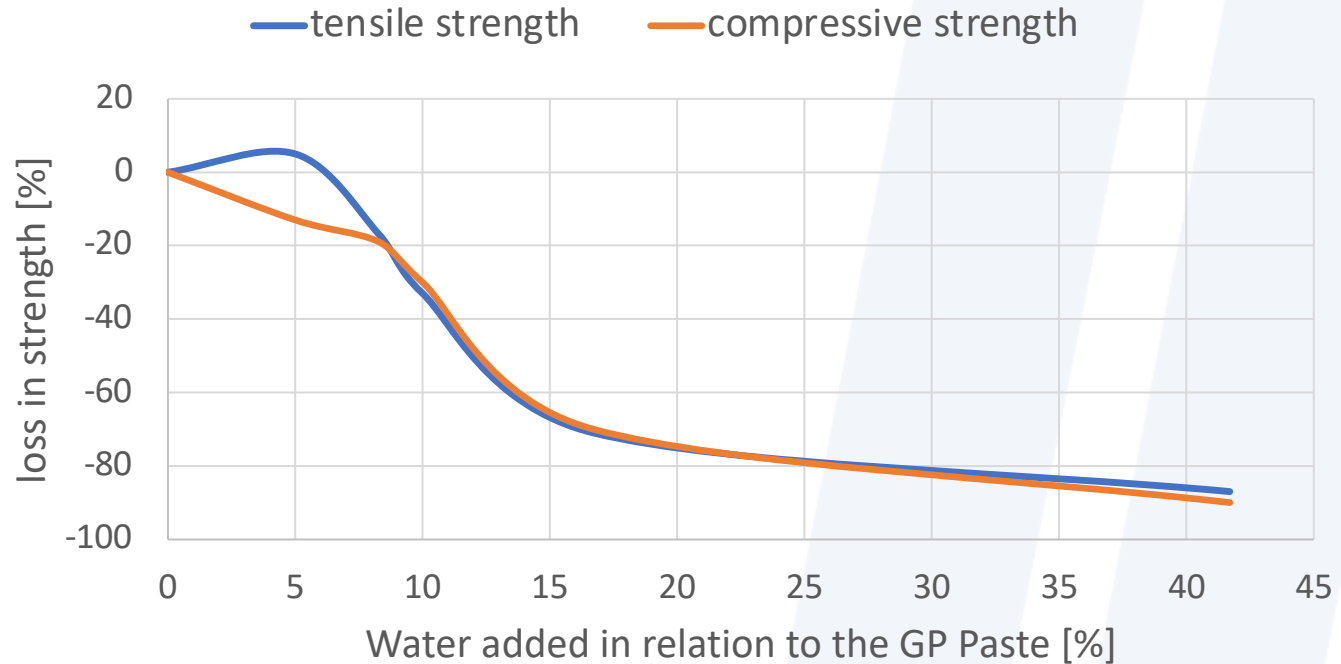
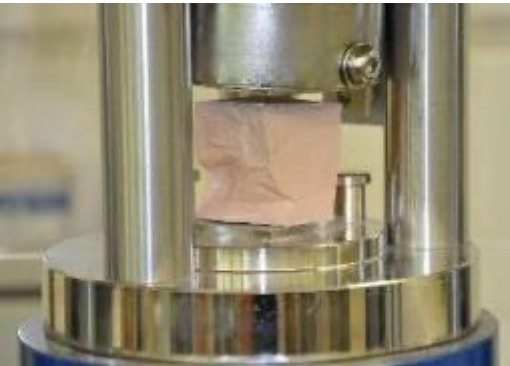
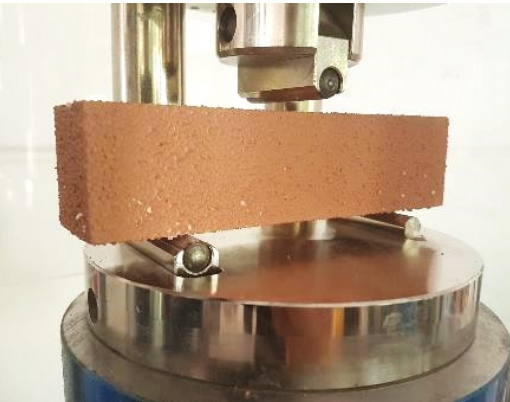
- Added on purpose to increase flowability / open time

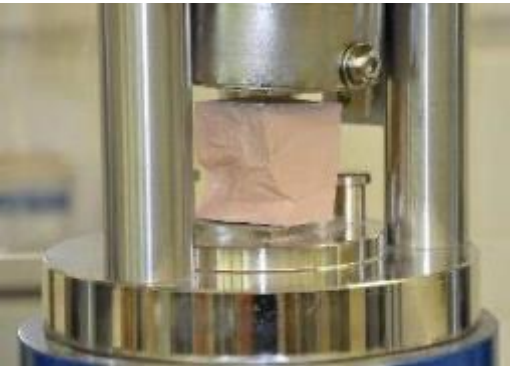
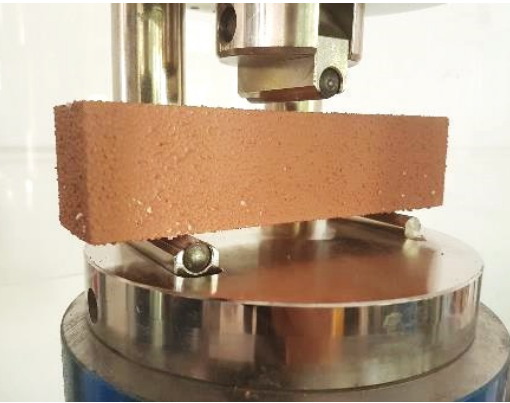
- Gravel / fillers



# Influence of water on the Strength

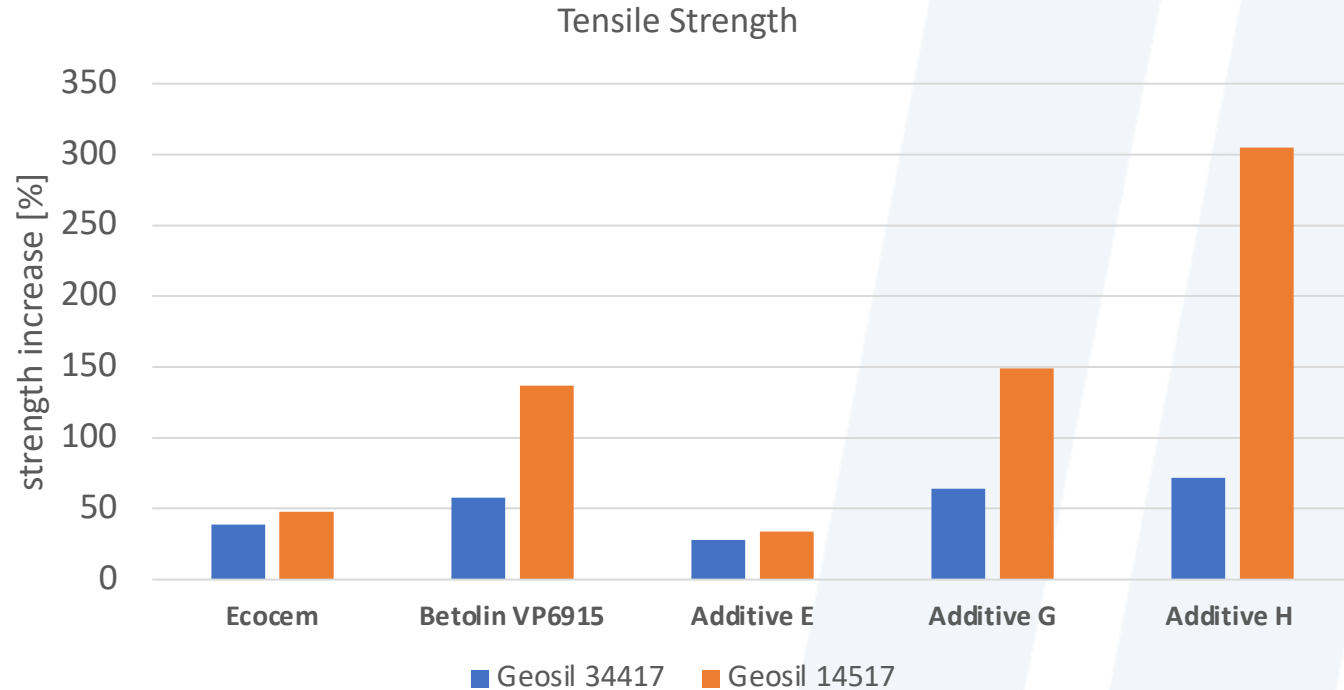
Strength according to DIN EN 196-1

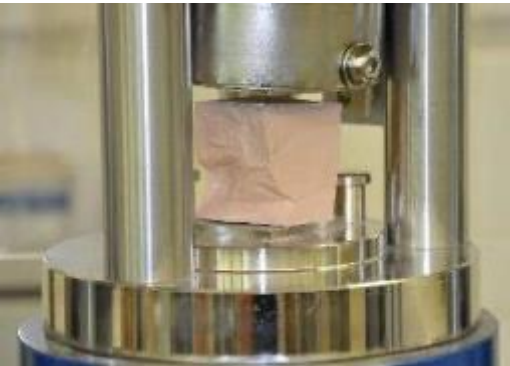
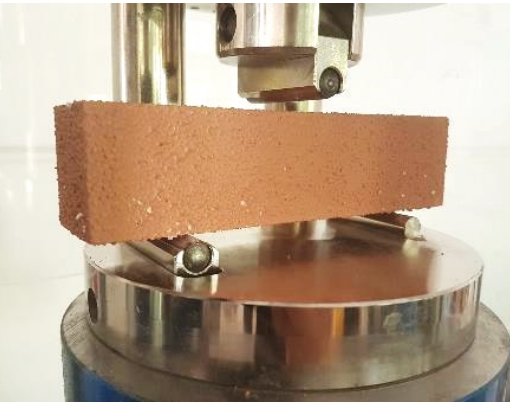




## How to compensate?

Strength according to DIN EN 196-1

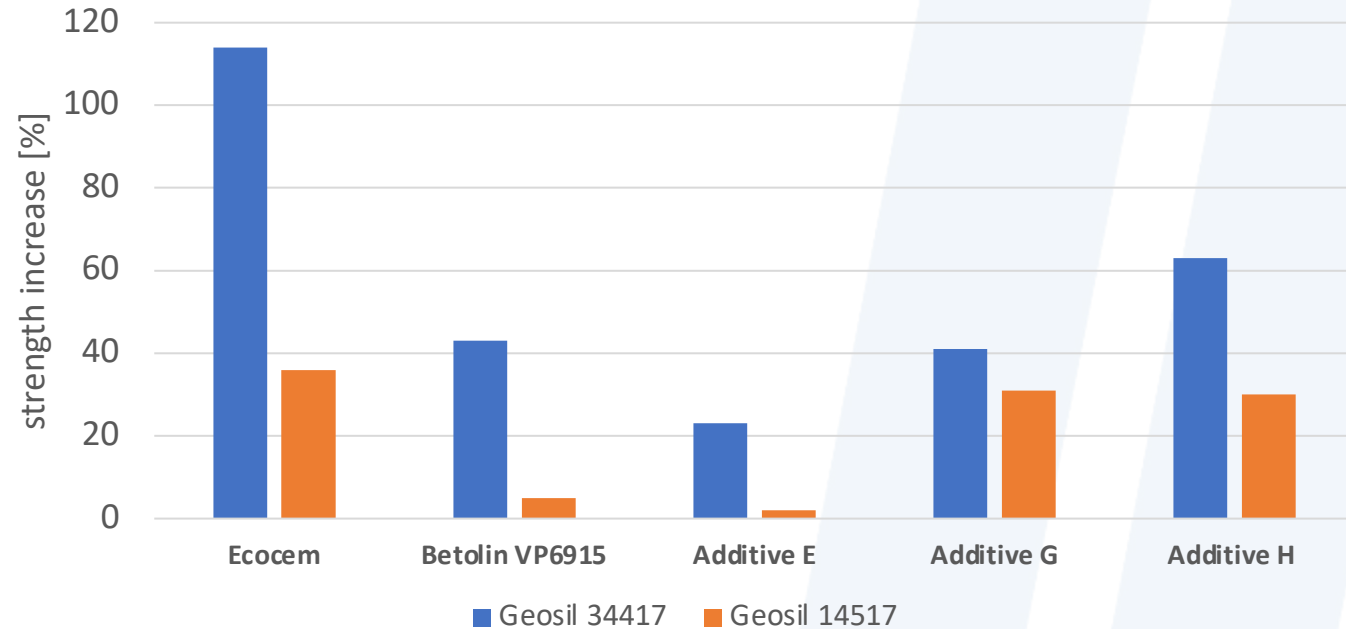




## How to compensate?

Strength according to DIN EN 196-1

Compressive strength



# Modification of the Geopolymer rheology





## Geopolymer rheology (Standard)

Workability according to DIN EN 1015-3



## Modification with 0,9% Geosil<sup>®</sup> WB 30

Workability according to DIN EN 1015-3



## Modification with 0,025% Betolin<sup>®</sup> VP-6915

Workability according to DIN EN 1015-3



## Modification with 0,2% Additive H

Workability according to DIN EN 1015-3



## Modification with 0,05% Betolin<sup>®</sup> VP-6944

Workability according to DIN EN 1015-3



## Conclusion

- Geosil Products are available in a lot of variations
- Too much water in the System reduces the performance of a Geopolymer
- There are ways to compensate the influence of the Water
- Our additives can adjust the rheology of Geopolymers

Your expert in  
**woellner**  
silicates & special chemicals  
chemical solutions

