

Geosil[®] – ready to use alkali silicates for Geopolymers

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woellner

- **Who we are**
- **Basics facts about alkali silicates**
- **New products for geopolymer-based systems**
- **Geosil® - Silicate binders for geopolymer-based systems**

COMPANY INTRODUCTION

Owned by Dr. Eduard Wöllner family foundation

Founded in 1896 – more than 125 years of experience

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 (Na_2O , K_2O , Li_2O) & silica (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 $MR = 2,5 - 5,0$



New products for geopolymer-based systems



Geosil® TB 10 and Geosil® TB 30

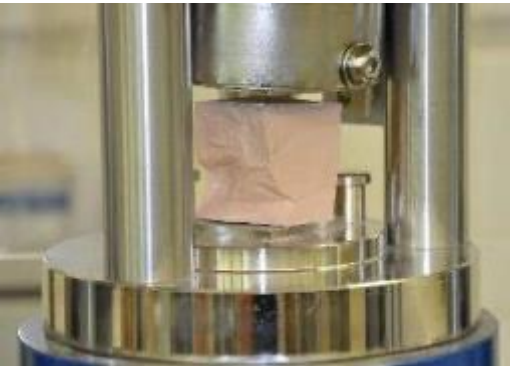
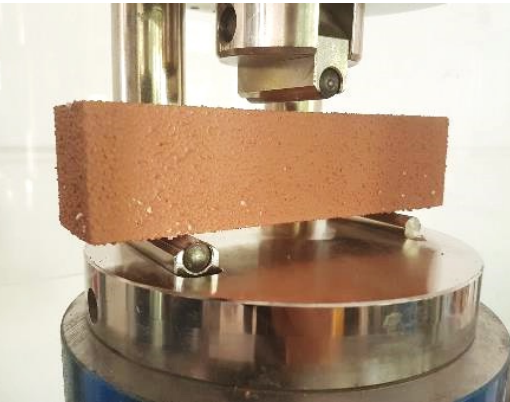
- Highly concentrated additives
- Can replace a part of the original Geosil®
- Can be adapted to your needs in a ready-to-use product

Pros

- + Improves the tensile strength
- + Improves the alkalination process

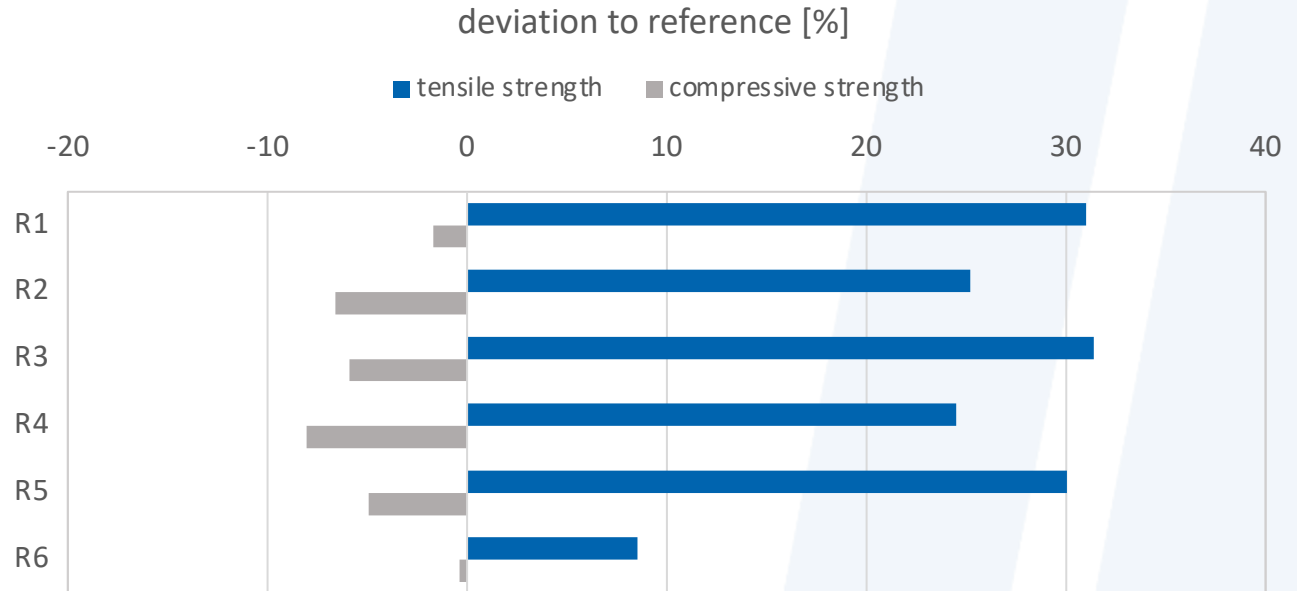
Cons

- Slight reduction of the compressive strength



Tensile strength booster Geosil[®] TB 10

Strength according to DIN EN 196-1



Tensile strength booster - overview

Product	Geosil® TB 10	Geosil® TB 30
Suitable for	Geosil® 14515/ Geosil® 14517	Geosil® 34417
Recommended dosage	0,5-3 %	0,5-3 %

Geosil® WB 10 and Geosil® WB 30

- Highly concentrated additives
- Can replace a part of the original Geosil®
- Can be adapted to your needs in a ready-to-use product

Pros

- + Improved workability
- + Reduction of mixing time possible

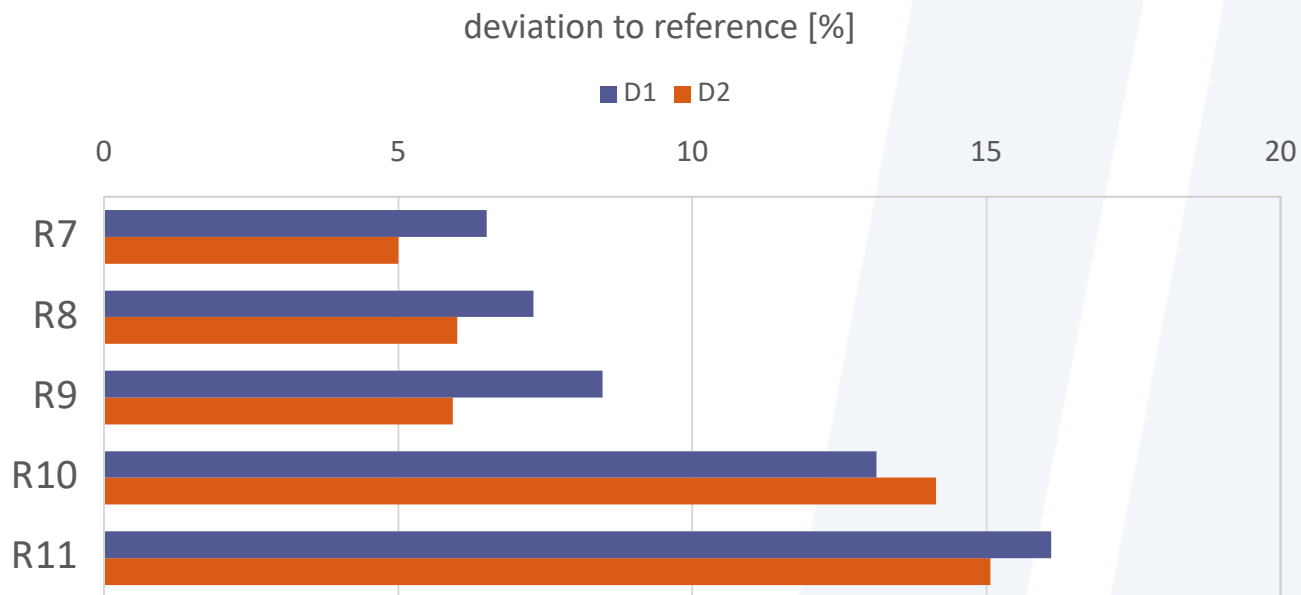
Cons

- Reduced open time



Workability booster Geosil® WB 10

Flow spread according DIN EN 1015-3



Workability booster - overview

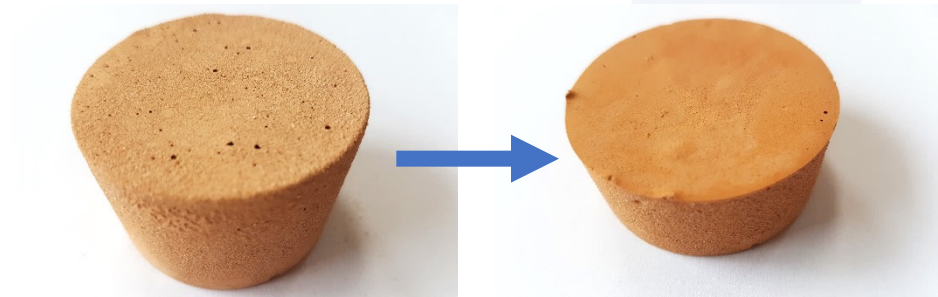
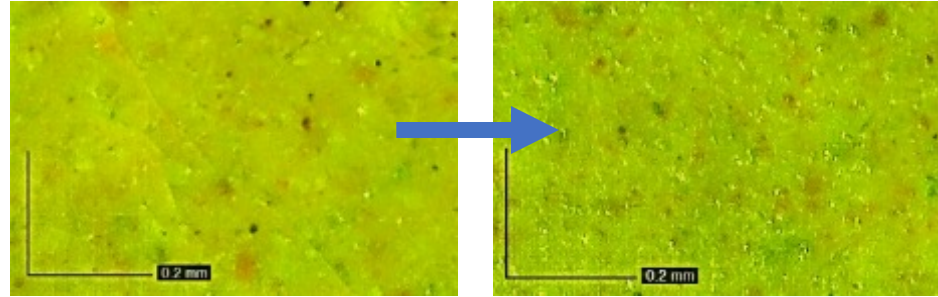
Product	Geosil® WB 10	Geosil® WB 30
Suitable for	Geosil® 14515/ Geosil® 14517	Geosil® 34417
Recommendation dosage	0,5-3 %	0,5-3 %

Still in progress...



The next generation of Geosil® with adapted Q-structure

- Reduced crack formation
- Reduced shrinkage
- Improved acid resistance
- Adjustable reactivity



Challenges

Take care to use only raw materials that are registered properly according to REACH



Geosil[®] - Silicate binders for geopolymer-based systems



Geosil® - Silicate binders for geopolymeric systems

- Geosils 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

- Limitation for some molar ratios: 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

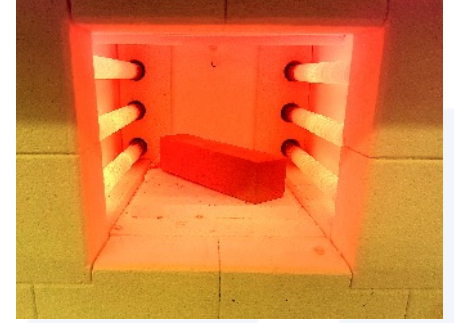
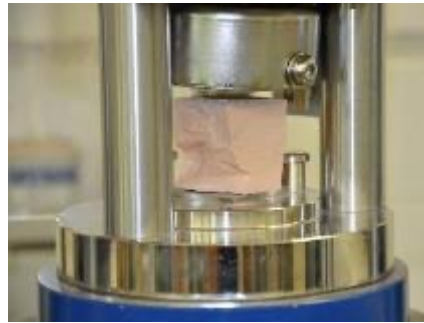
Product	Geosil® TB 10	Geosil® TB 30	Geosil® WB 10	Geosil® WB 30
Suitable for	Potassium silicate	sodium silicate	Potassium silicate	sodium silicate
Viscosity [mPa·s]	Ca. 20	Ca. 370	Ca. 20	Ca. 170
CLP - classification	H315 / H318	H315 / H318	H315 / H318	H315 / H318
CLP - label				
ADR - classification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

R&D work

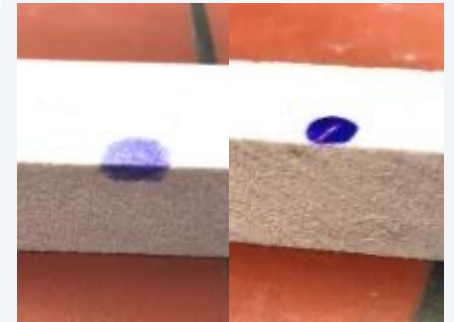
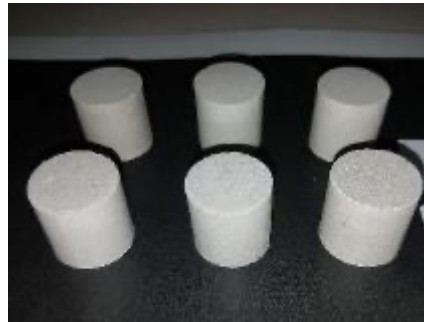


- Raw material studies
 - Reactive raw materials
 - Functional and non-functional fillers
- How to reinforce? (✓)
 - Fiber materials
 - Laminated structured materials
- Additive study
 - Liquefying ✓
 - Retarding
 - Shrinking
 - Cracking

Equipment



Customer-related formulation development



Your expert in
woellner
silicates & special chemicals
chemical solutions

