Geosil® – ready to use alkali silicates for Geopolymers

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- Basics of alkali silicates, production methods, properties
- GEOSIL® Products
- Alkali silicates + Brown Cole Fly Ash
Introduction
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- Owned by Dr. Eduard Wöllner family foundation
- 120 years of experience (founded in 1896)
- 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. 140 employees
- Annual turnover approx. 50 million Euros
- Locations in Germany and Austria
Introduction

Ludwigshafen: headquarter and production site

Bad Köstritz: production site

Gratwein-Straßengel: sales department and production site
Basics of alkali silicates
Basics of alkali silicates

- Glasses soluble in water, resulting from combinations of alkali metal oxide (Na, K, Li) & silica (SiO$_2$) in varying proportions

- Alkali silicates are generally not distinct stoichiometric chemical substances

- no specific chemical formula for each product

- Trivial name = Waterglass

- Products available as solution and powder
Melting / solving process

\[ \text{Me}_2\text{CO}_3 + n\text{SiO}_2 \rightarrow \text{Me}_2\text{O} \cdot n\text{SiO}_2 + \text{CO}_2 \]

Me = Na, K

SiO\(_2\) Source

Alcali Carbonate

furnance

Autoclave

storage

Filter

storage

fine tuning
Hydrothermal process

\[ 2 \text{MeOH} + n\text{SiO}_2 \rightarrow \text{Me}_2\text{O} \cdot n\text{SiO}_2 + \text{H}_2\text{O} \]

Me = Na, K
Basics of alkali silicates

Molar ratio (MR) $\Rightarrow$ mol SiO$_2$ / mol Me$_2$O

Weight ratio (WR) $\Rightarrow$ % SiO$_2$ / % Me$_2$O

Molar ratio $\Leftrightarrow$ Weight ratio

Sodium silicate: \[ MR = 1,032 \cdot WR \]
Potassium silicate: \[ MR = 1,566 \cdot WR \]
Lithium silicate: \[ MR = 0,497 \cdot WR \]
Basics of alkali silicates

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

- molar ratio \((\text{SiO}_2 : \text{Na}_2\text{O})\) 1,7 to 3,9
- molar ratio \((\text{SiO}_2 : \text{K}_2\text{O})\) 1 to 3,9
- molar ratio \((\text{SiO}_2 : \text{Li}_2\text{O})\) 2,5 to 5

pH-value of silicate solution between 11 – 14
Properties

- inorganic chemistry
- good chemical reactivity
- sticky solutions
- good adhesion properties
- incombustible
- capable to seal
- reinforcing
- good availability
GEOSIL® Products
GEOSIL® Products

- ready formulated mixtures
- userfriendly - no hydroxide handling
- high purity of raw materials
- reproduceable & controlled production process
- guarantee of chemical composition
- long shelf life / stable solution
- worldwide shipping
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>Geosil 34417</td>
<td>Sodium silicate</td>
</tr>
<tr>
<td>Geosil 54217</td>
<td>Sodium / potassium mixed silicate</td>
</tr>
<tr>
<td>Geosil 14515</td>
<td>Potassium silicate (ADR product)</td>
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# GEOSIL® Products

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<td>Geosil 14517</td>
<td>Potassium silicate (non ADR product)!</td>
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<td>Name</td>
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<tr>
<td>Betol 39 T and 52 T</td>
<td>Sodium silicates</td>
</tr>
<tr>
<td>Betol K 35 T</td>
<td>potassium silicate</td>
</tr>
<tr>
<td>Betol H 35</td>
<td>Hardener for alkali silicates</td>
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Application with GEOSIL® and Betol® Products

- geopolymer concrete
- geopolymer adhesive
- geopolymer mortar
- inorganic foam
- toxic waste immobilisation
- composites
- steel coating
- thermal insulation boards
- fire protection boards
- refractory bricks
- pavement stone
- facade elements
- arts & decoration
The partner by your side