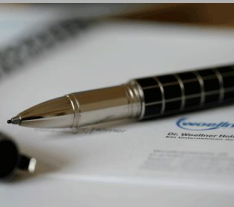




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Basics of alkali silicates

Dr. Martin Leute

Wöllner Austria GmbH

Fabriksstrasse 4-6

A-8111 Judendorf-Strassengel

Austria

Mail: martin.leute@woellner.at

Jörg Lind

Wöllner France SRL

14 bis, rue du Crochet

F-02310 Nogent l'Artaud

France

Mail: joerg.lind@woellner.fr

- **Woellner Group portrait**
- **Application alkali silicates**
- **Basics about alkali silicates**
 - **Definition**
 - **Production of alkali silicates**
 - **Definition molar ratio**
 - **Properties molar ratio**
- **How Wöllner can support you**
- **Advantage of industrial produced alkali silicates**
- **Labeling**

Woellner Group

Woellner Group - portrait



Facts and figures:

- 2 strategic business units:
- silicates and special chemicals
- writing inks
- 350 employees
- approx. 110 Mio € turnover
- approx. 250.000t liquid silicates
- 115 years experience
- production sites
Germany, Austria, France & China



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Brands of Wöllner silicates



Betol[®]
Inorganic
Binders

Verisil[®]
Special Silicates
for Paper Industry

Betolin[®]
Specialties for Paints,
Coatings and Construction

Warosit[®]
Process Chemicals
for Paper Industry

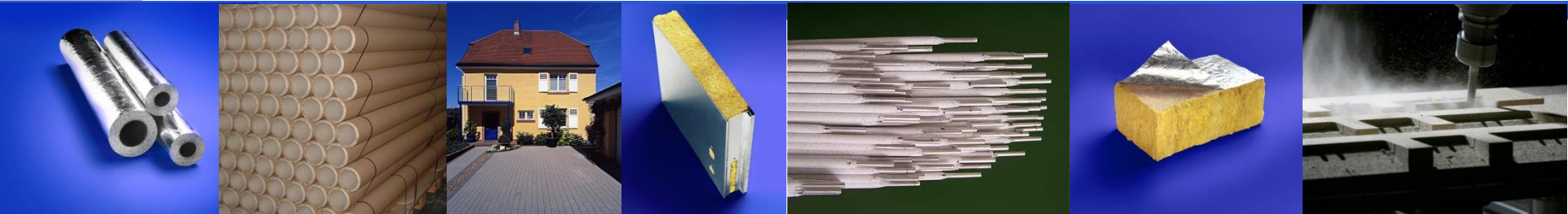
Collosil[®]
Special Adhesives

Silicates
Na, K and Li
Silicates

Simet[®], Nabion[®]
Metasilicates
and Co-builders



Application silicates



detergents
precipitated silica
silica sol
zeolithe
paper deinking

construction
coatings
welding
refractories
thermal insulation
fire protection
foundry
tube winding
ceramics
geopolymer

Basics of alkali silicates

Soluble silicates...

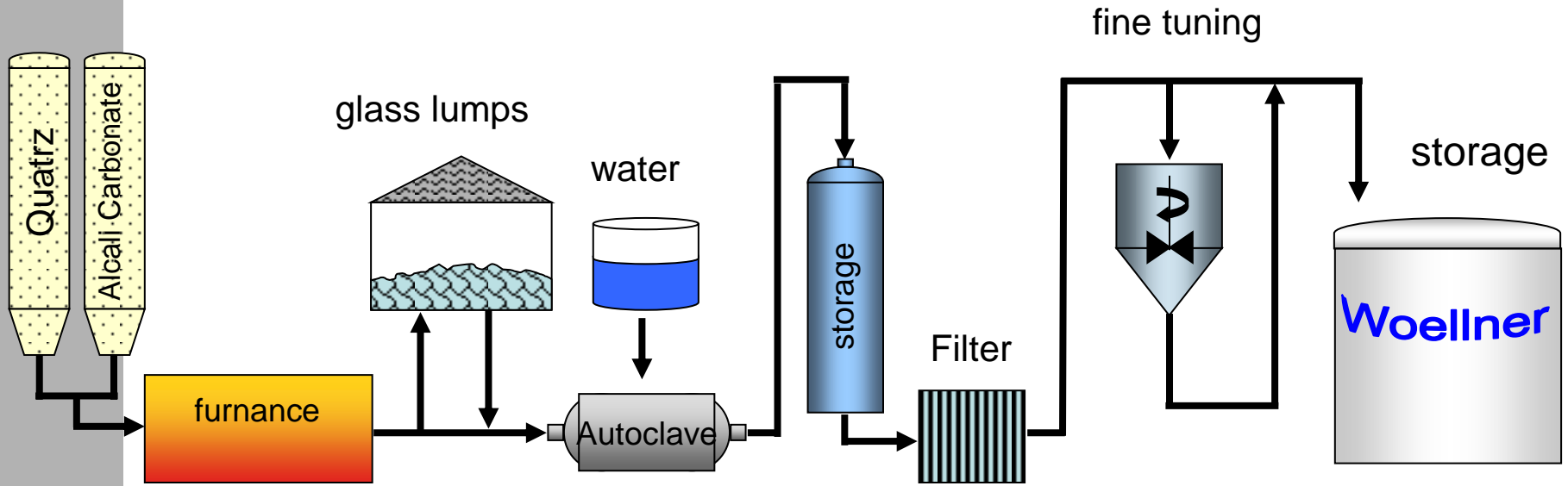
..are generally not distinct stoichiometric chemical substances

- no specific chemical formula
- no molecular weight

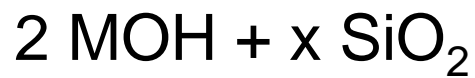
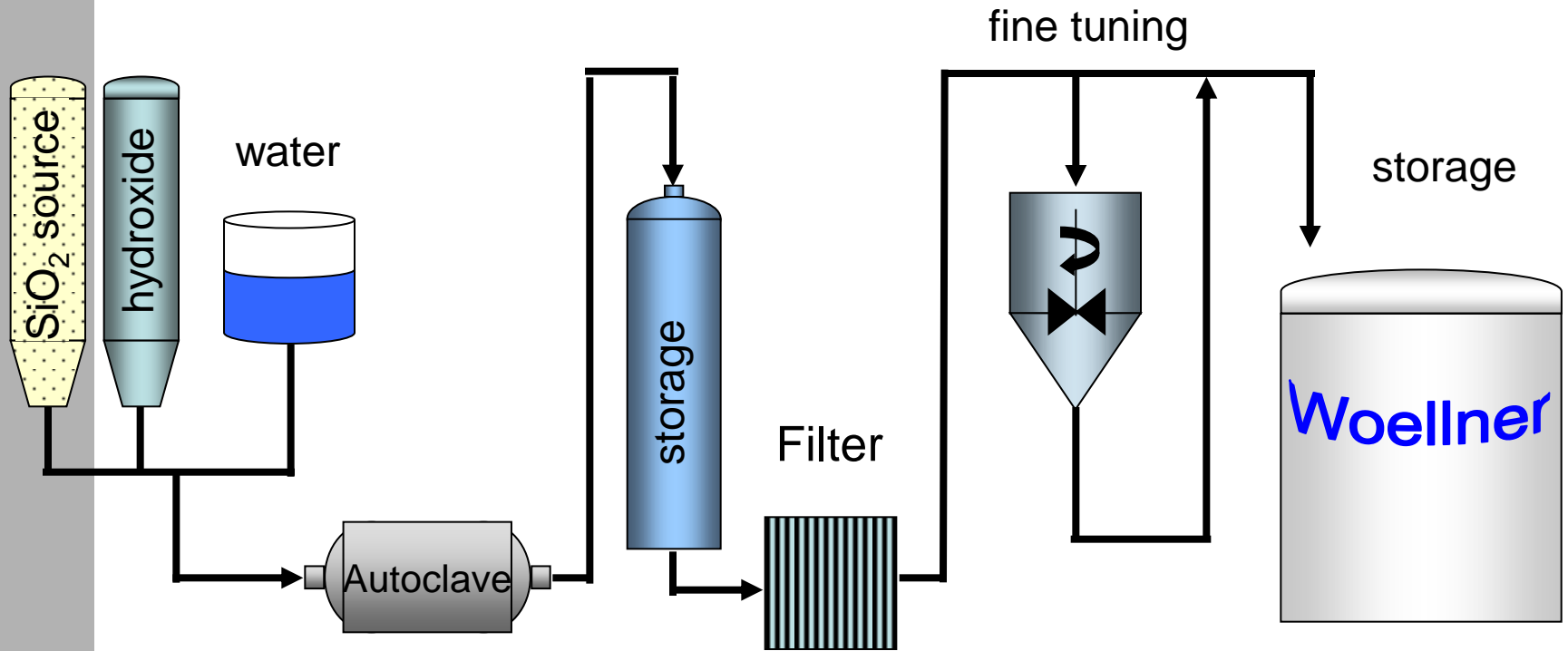
They are glasses or aqueous solutions of glasses, resulting from combinations of **alkali metal oxide & silica** in varying proportions.



Melting/Solving Process



Hydrothermal process



M = Na, K, Li

technical significant liquid silicates:

- molar ratio ($\text{SiO}_2 : \text{Na}_2\text{O}$) 1,7 to 4,1
- molar ratio ($\text{SiO}_2 : \text{K}_2\text{O}$) 1 bis 3,95
- molar ratio ($\text{SiO}_2 : \text{Li}_2\text{O}$) 2,5 & 5

types:

liquid solution or soluble powders

pure silicates / blended silicates (Na/K, Na/K/Li, K/Li, Na/Li)

prestabilized silicates

modified silicates (organic & inorganic)

pH-value of silicate solution:

10,5-14

Definition molar ratio

weight ratio:

$$WR = \frac{\text{wt. \% SiO}_2}{\text{wt. \% M}_2\text{O}}$$

molar ratio:

$$MR = \frac{\text{Mol SiO}_2}{\text{Mol M}_2\text{O}}$$

MR \Leftrightarrow WR

sodium silicate:

$$MR = 1,032 \cdot WR$$

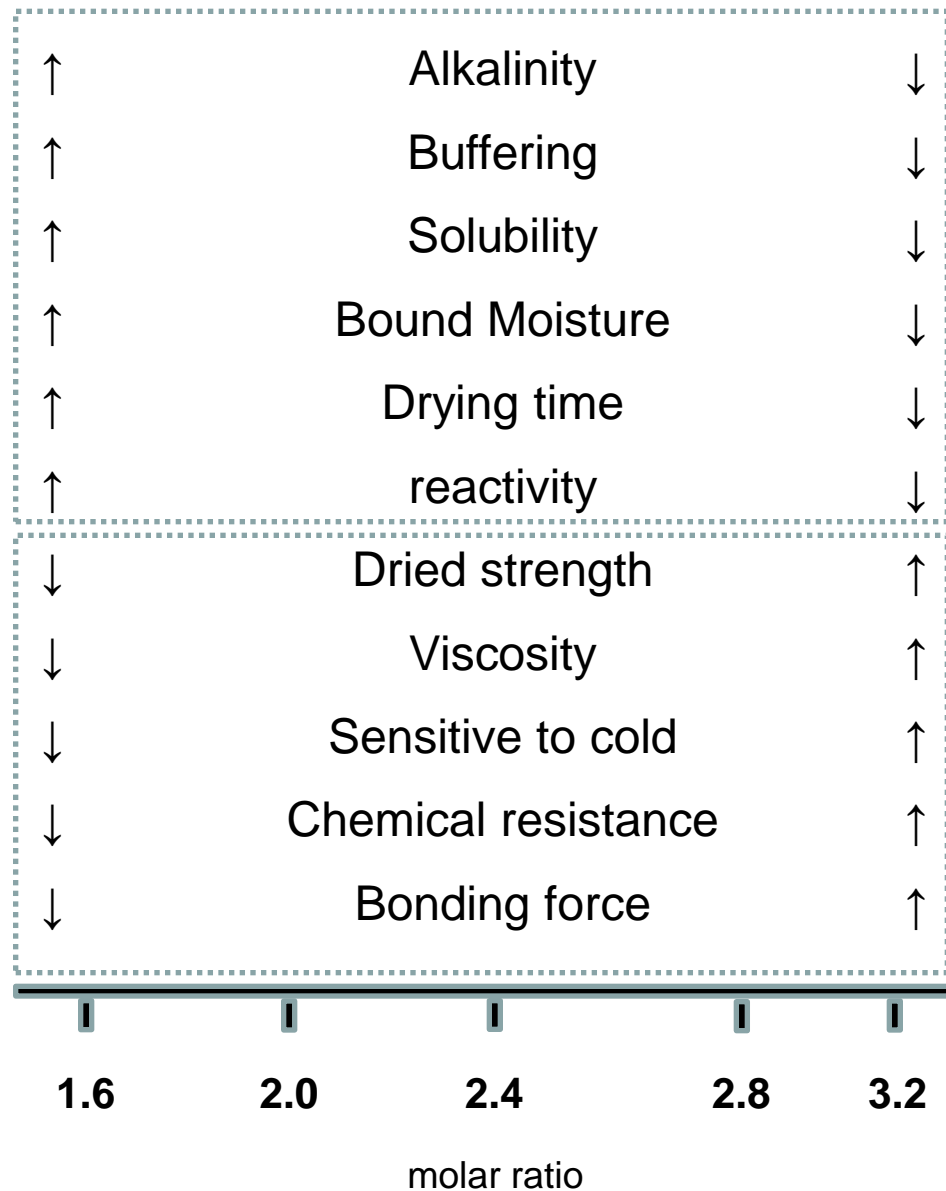
potassium silicate:

$$MR = 1,566 \cdot WR$$

lithium silicate:

$$MR = 0,497 \cdot WR$$

Properties of pure alkali silicates according molar ratio



How Wöllner can support you









- Existing product range (Betol®) based on Na, K & Li
- customized alkali silicates
- ready to use activator solution
- Additives compatible in high pH-Values (thickener, dispersing agent, hydrophobic agent, surfactant, stabilizer)
- technical support for customers

liquid silicates	molar ratio
Potassium silicate	1-3,95
Sodium silicate	1,7-4,1
Blended silicate	1,3-3,5
Lithium silicate	2,5 & 5

Advantage of industrial produced alkali silicates



- high purity of raw materials
- controlled production process
- reproducibility
- high quality level
- high stability of solution
- availability
- guarantee of chemical composition
- long shelf life

molar ratio $\text{SiO}_2 : \text{M}_2\text{O}$	powder	solution
$\text{MR} \leq 1,6$	 Danger	 Danger
$1,6 < \text{MR} \leq 2,6$	 Danger	 Danger
$2,6 < \text{MR} \leq 3,2$	 Warning	 Warning
$\text{MR} > 3,2$	-	no labeling (solid < 40%)



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Thank you for your attention