Chemical strengthening of glass
Chemical strengthening of glass

- Introduction
- Principle / Characteristics
- Applications
- State-of-the-art bath process
- New concepts
Chemical strengthening of glass

- Before:
  - Sodium
  - Oxygen
  - Silicon

- After:
  - Sodium
  - Oxygen
  - Silicon
  - Potassium
Chemical strengthening of glass

TRACTION
0 20 40
COMPRESSION
0 20 40

Energy (Joules)

Glass Thickness (mm)
1 m 2 m 3 m 4 m 5 m

Drop ball (225gr)

THERMAL TEMPERING
CHEMICAL TEMPERING

NORMAL GLASS (NOT TEMPERED)
CHEMICAL TEMPERING
TEMPERED GLASS
Chemical strengthening of glass

- High resistance against mechanical impact
- High resistance against scratches
- No optical distortion
- Tempering of thin glass possible
- Low energy consumption
Chemical strengthening of glass

Applications

- Display and cover glass
- High speed trains and cars
- Boats and Yachting
- Military applications
- Security glass and fire protection doors
- Architectural glass
- Aircraft industry
- Table ware
- Optical glass
- Lighting applications
- Washing machine windows
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Technological process

- Glass preparation
- Rack loading
- Preheating
- Ion exchange in a salt tank
- Cooling
- Washing
- Drying
- Unloading
Fully automatic batch process
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Chemical strengthening of glass

Preheating chamber / Rack with thin glass
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Tank / Salt filling
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Washing

Shower tunnel

Warm water

Cold water (deionized water)
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Rack for hollow glass
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Semi continuous process (salt bath)
Chemical strengthening of glass

Semi continuous process (salt bath)
Chemical strengthening of glass

Continuous process (salt bath)
Continuous process (spray coating)
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Double ring bending strength

Cycle time [h] vs. Temperature [° C]

Strength [Mpa]
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Spray coating process

- Continuous process
- High throughput
- Specifically low tempering costs
- Relatively low energy consumption
- Same DOL (depth of layer) as in salt bath
- Low salt consumption
- Always constant process conditions
Chemical strengthening of glass

Test unit (spray coating)
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Technical concept (spray coating)
## References

<table>
<thead>
<tr>
<th>Client</th>
<th>Country</th>
<th>Tank size (mm) L x W x H</th>
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<tbody>
<tr>
<td>Saint Gobain Vitrage</td>
<td>France</td>
<td>2000 x 1250 x 1200</td>
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<td>Saint Gobain Vitrage</td>
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