Silica Corrosion
- mechanisms and test methods

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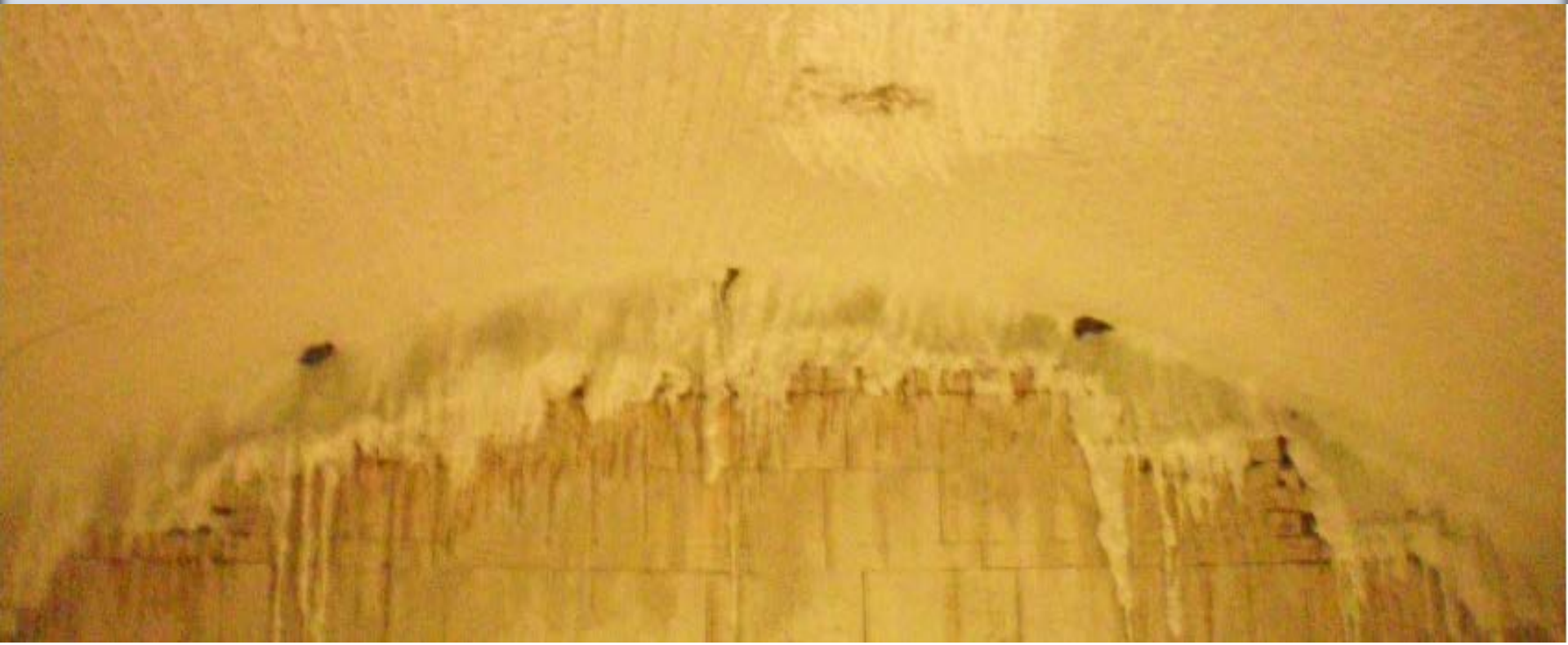
Content

Silica Corrosion – examples from glass industry



Melter crown with silica:

> 10 years in oxy fuel furnace

Silica Corrosion – examples from glass industry

Silica dripping

over AZS super structure

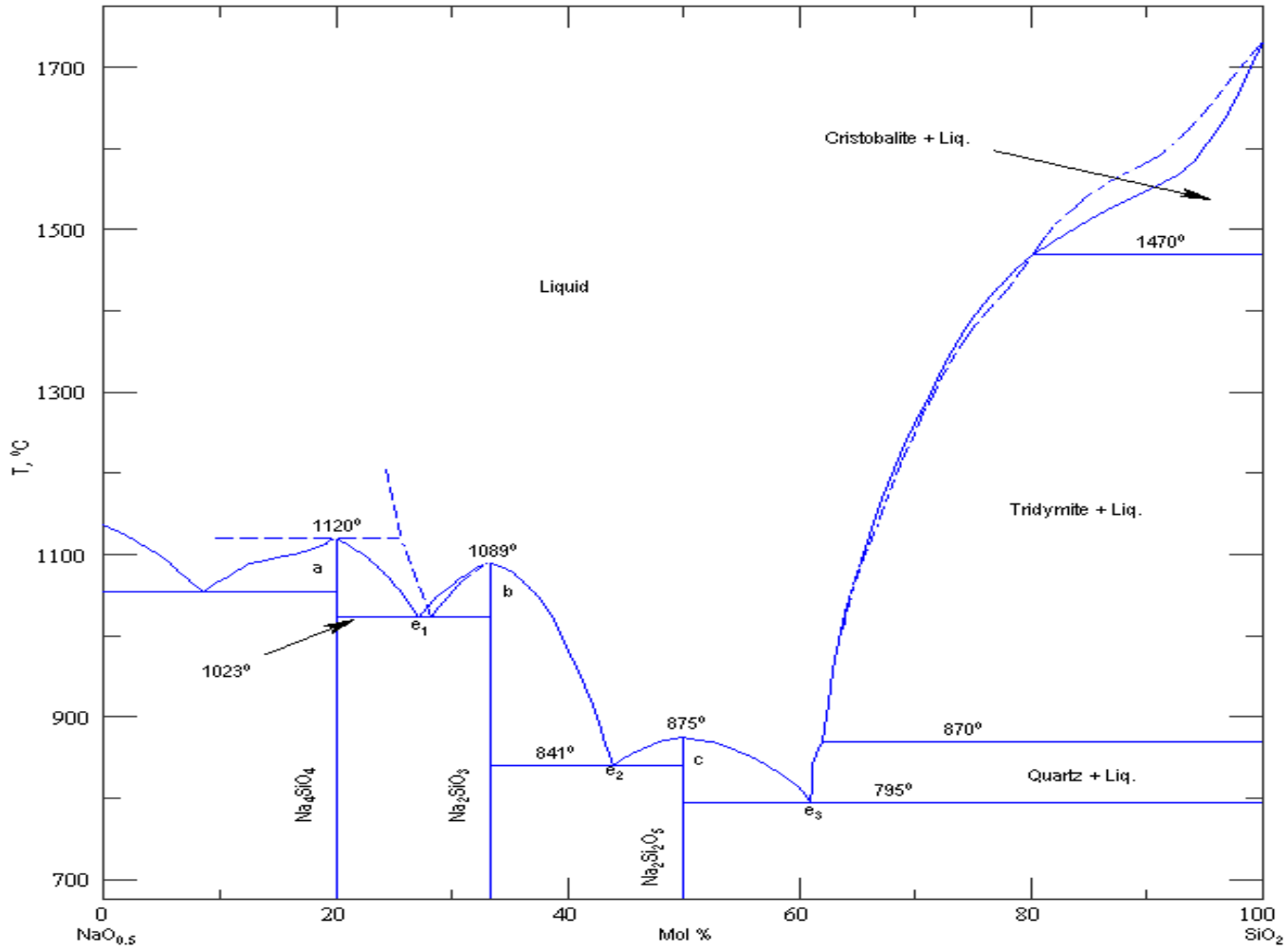
Silica Corrosion – examples from glass industry

Silica:

Regenerator target wall

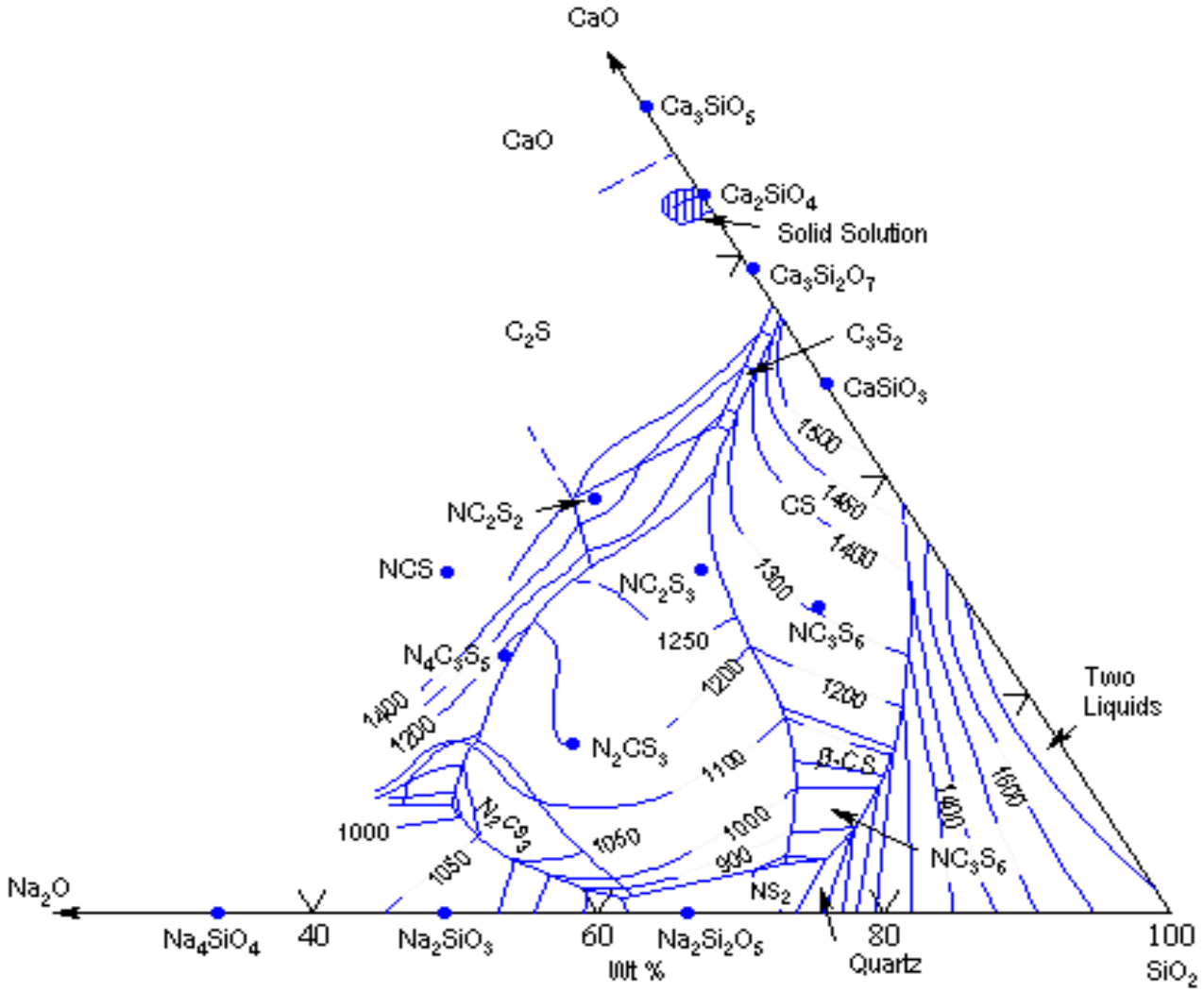
Silica Corrosion – mechanisms

System
Na_2O-SiO_2



Silica Corrosion – mechanisms

System
Na_2O-SiO_2-CaO

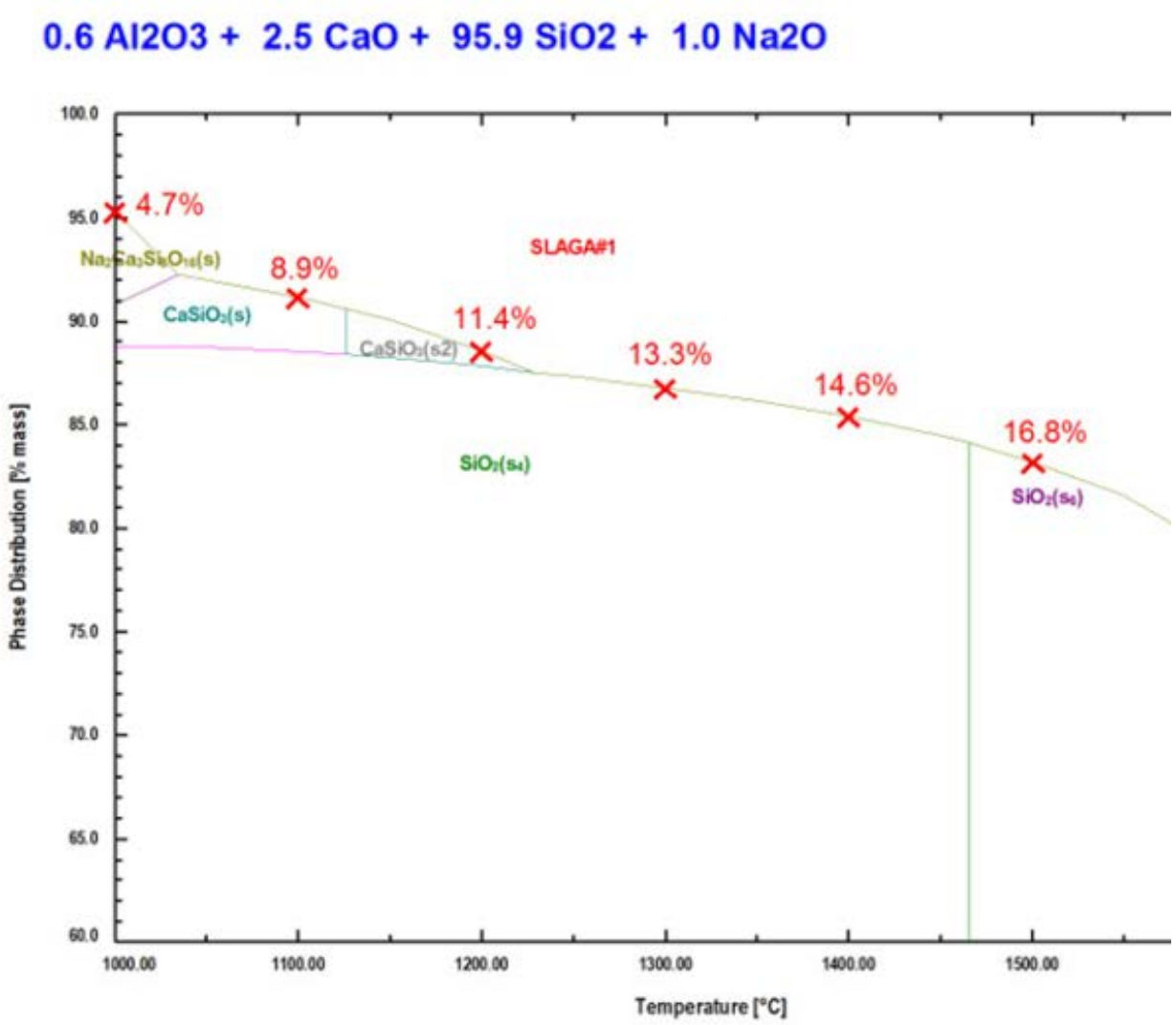


Silica Corrosion – mechanisms

Thermal dynamic calculation for standard silica:

On hot face of standard silica at 1500°C:

17% slag (if 1% Na_2O)
30% slag (if 2% Na_2O)



Silica Corrosion – test methods

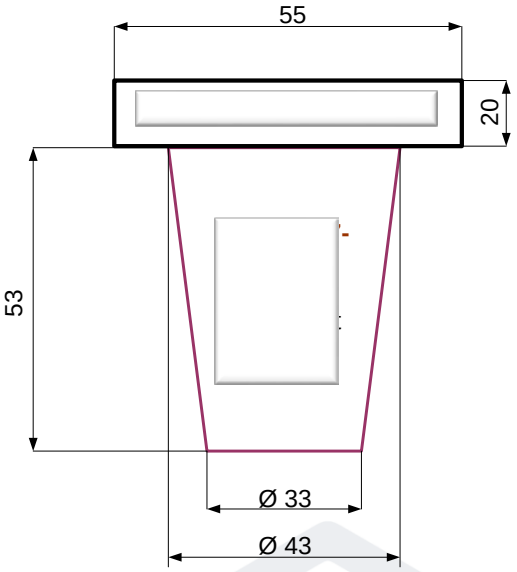
Overview

	Alkali vapour	Carryover	Furnace Atmophere	Temperature gradient	Long time
ASTM C987	x				
2 Step Crucible Test (RHIM)	x	x			
Field test	x	x	x		
Post mortem	x	x	x	x	x

Silica Corrosion – test methods

ASTM C987

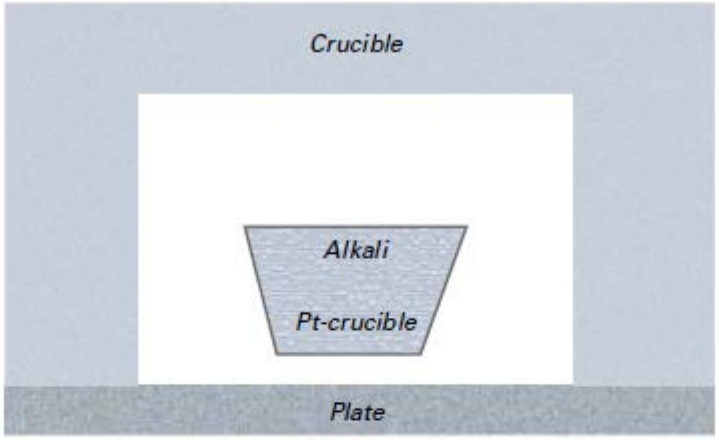
Standard Test Method
for Vapor Attack on Refractories for
Furnace Superstructures



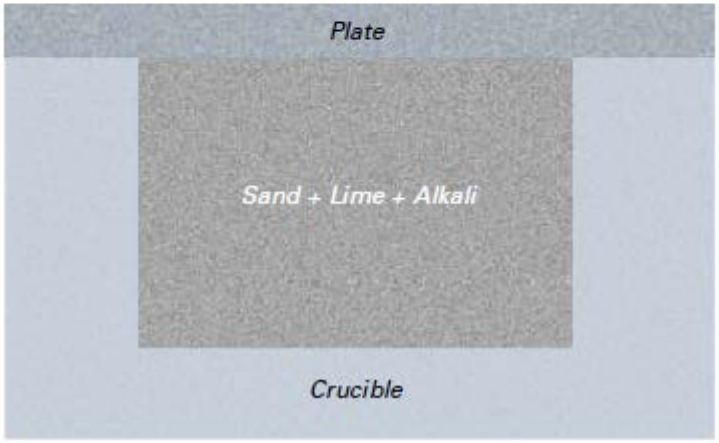
Silica Corrosion – test methods

2 Steps Crucible Test

- Until now test for regenerator materials
- Can be done for silica bricks



First step: Na_2CO_3 and Na_2SO_4 (1370 °C)



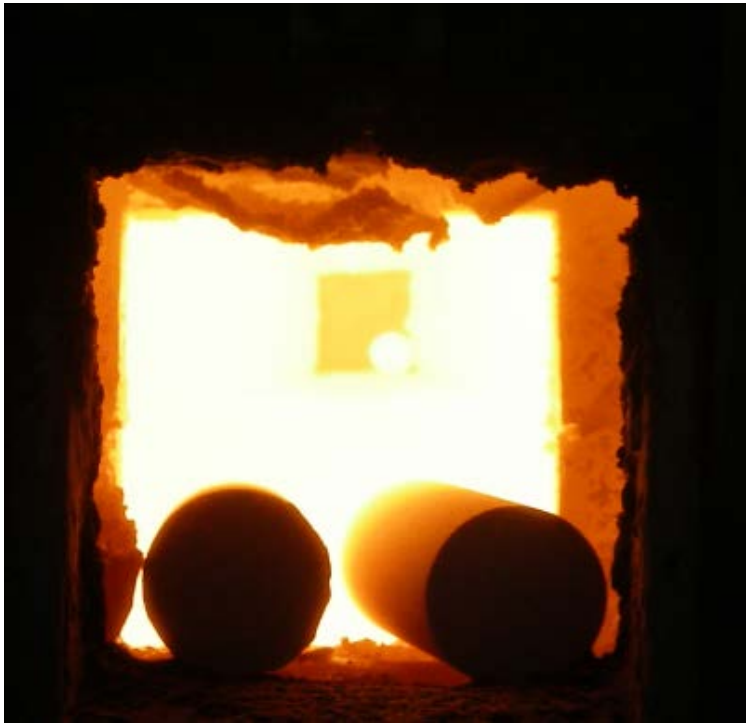
Second step: Sand, lime, Na_2CO_3, and Na_2SO_4 (1470 °C)

Silica Corrosion – test methods

Field test:

standard silica
vs No-Lime Silica

- Oxy- Fuel
- Superstructure



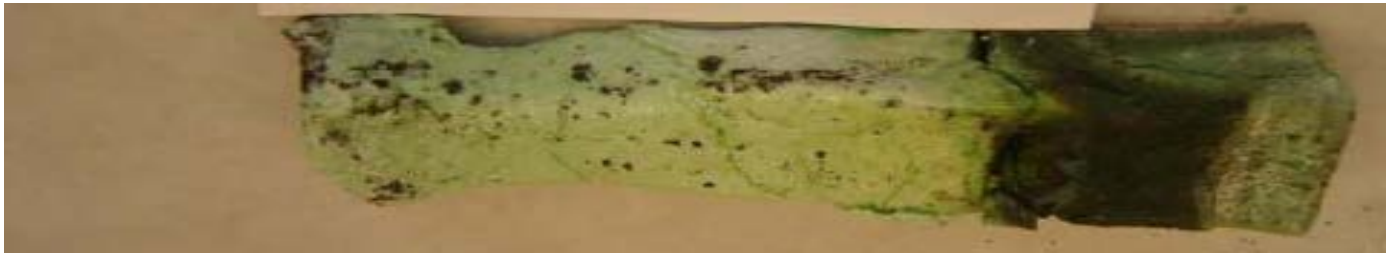
Silica Corrosion – test methods

Post morten

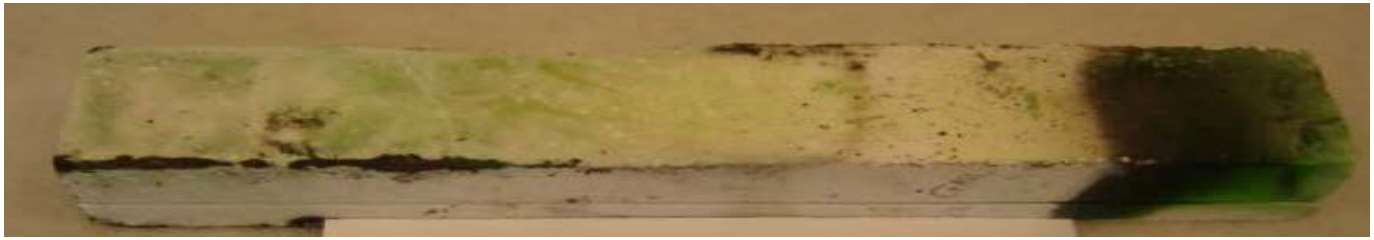
Silica Corrosion – Analysis

- Standard Silica

Field test



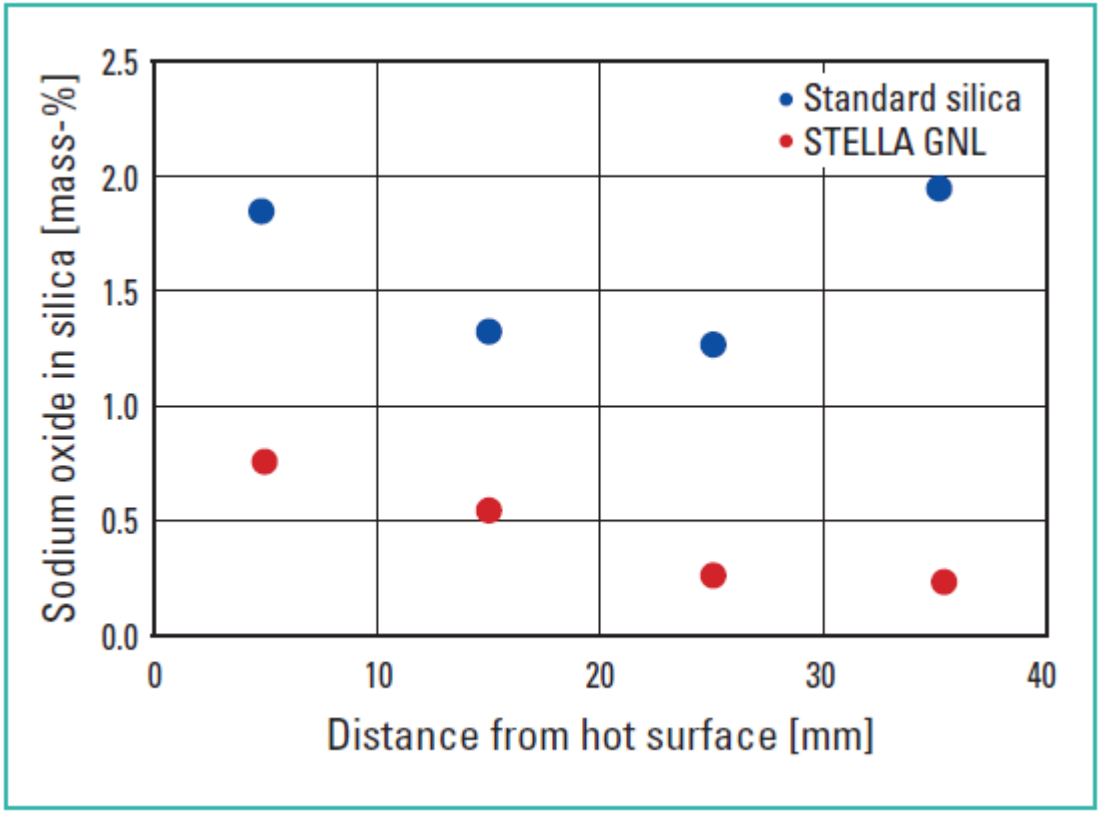
- silica without lime bonding



Silica Corrosion – Analysis

absorption
of alkali

Field test



Silica Corrosion – Analysis

Post mortem

Brand		0-30 mm	140-160 mm
Chemical Analysis:			
Loss on ignition	% by wt.	0,23	0,31
Oxides after ignition[1)]			
Na_2O		0,43	1,29
Al_2O_3		0,46	0,59
SiO_2		98,1	94,0
SO_3		0,10	0,02
K_2O		0,04	0,11
CaO		0,72	3,51
Fe_2O_3		0,09	0,40
ZrO_2		0,02	< 0,01

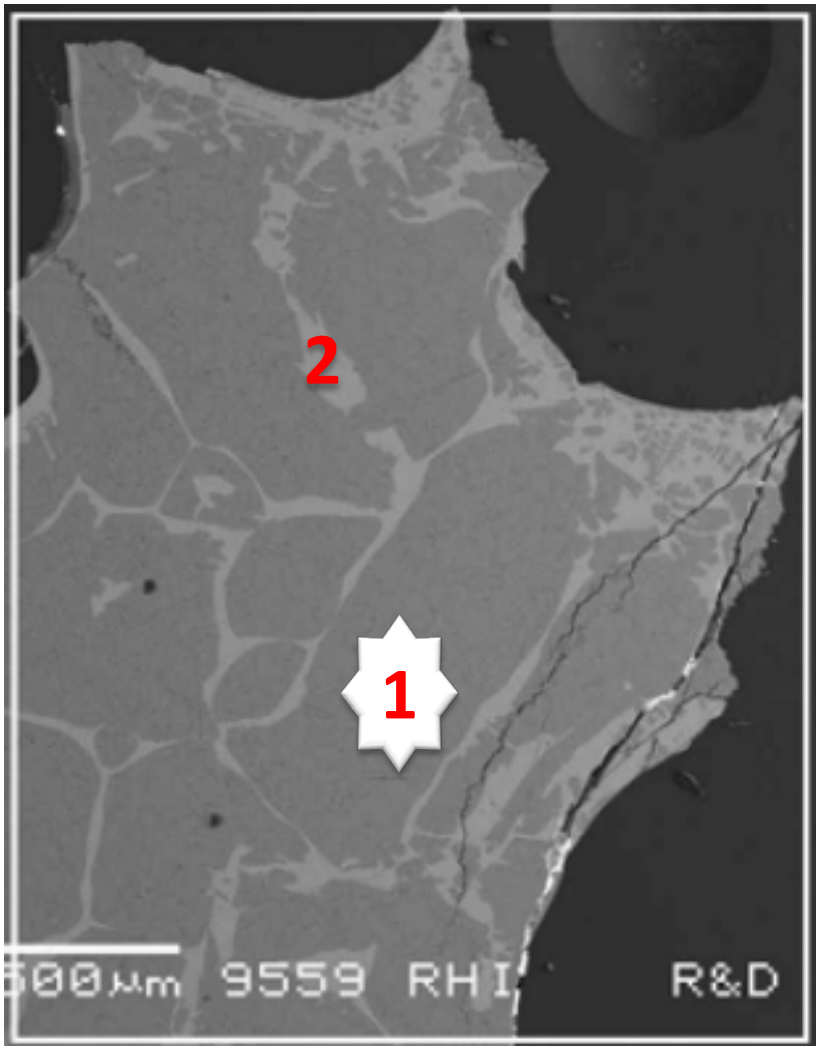
Silica Corrosion – Analysis

Post mortem

Hot face 1:

„glassy phase“ with CaO

	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO
1				100		
2 - glassy phase	6,7	0,8	1,7	68,6	0,9	20,2

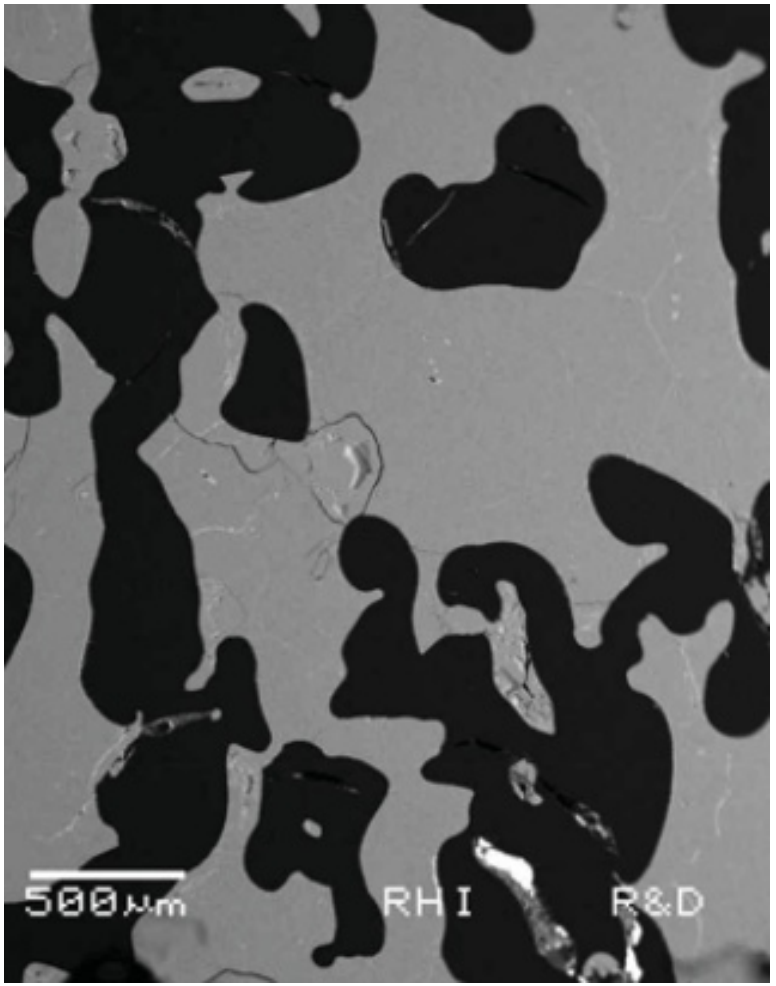


Silica Corrosion – Analysis

Post mortem

Hot face 2:

- Glassy phase already dripped out
- SiO_2 crystal islands remain



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Final Question

Which methods do you like?

	Alkali vapour	Carryover	Furnace Atmophere	Temperature gradient	Long time
ASTM C987	x				
2 Step Crucible Test (RHIM)	x	x			
Field test	x	x	x		
Post mortem	x	x	x	x	x

Get in touch

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