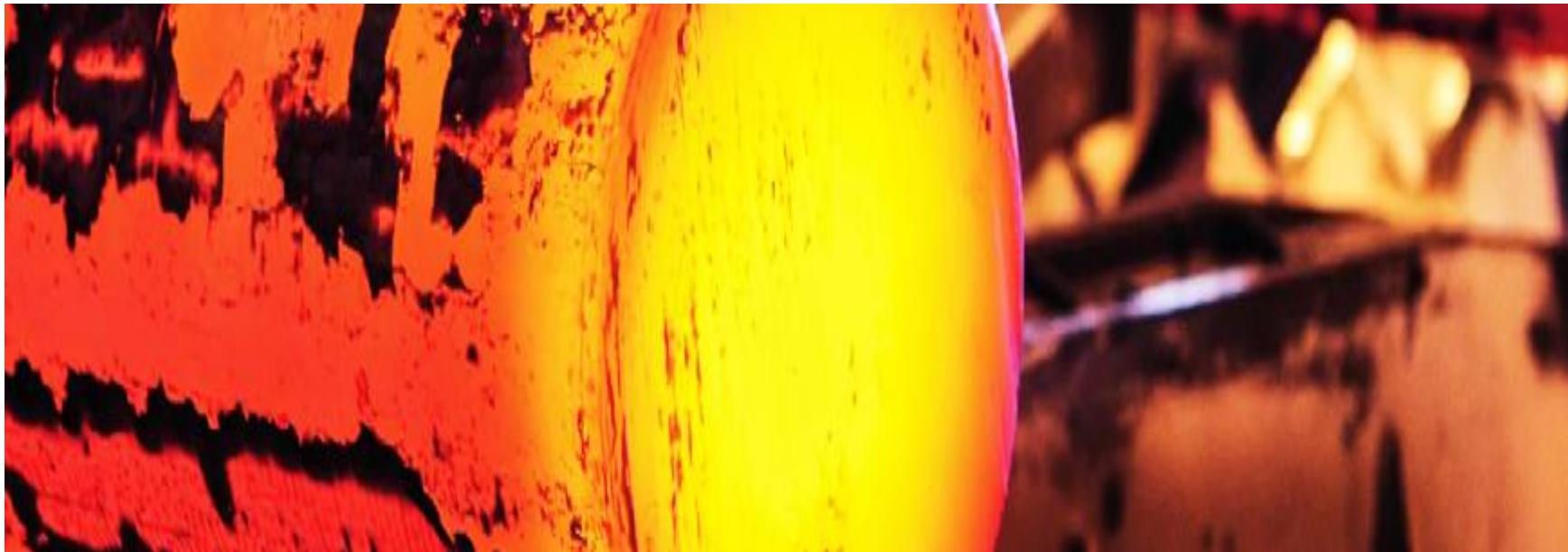


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Lightweight refractory brick with improved corrosion behaviour based on Calciumhexaaluminate

Volker Krasselt, Juergen Rank



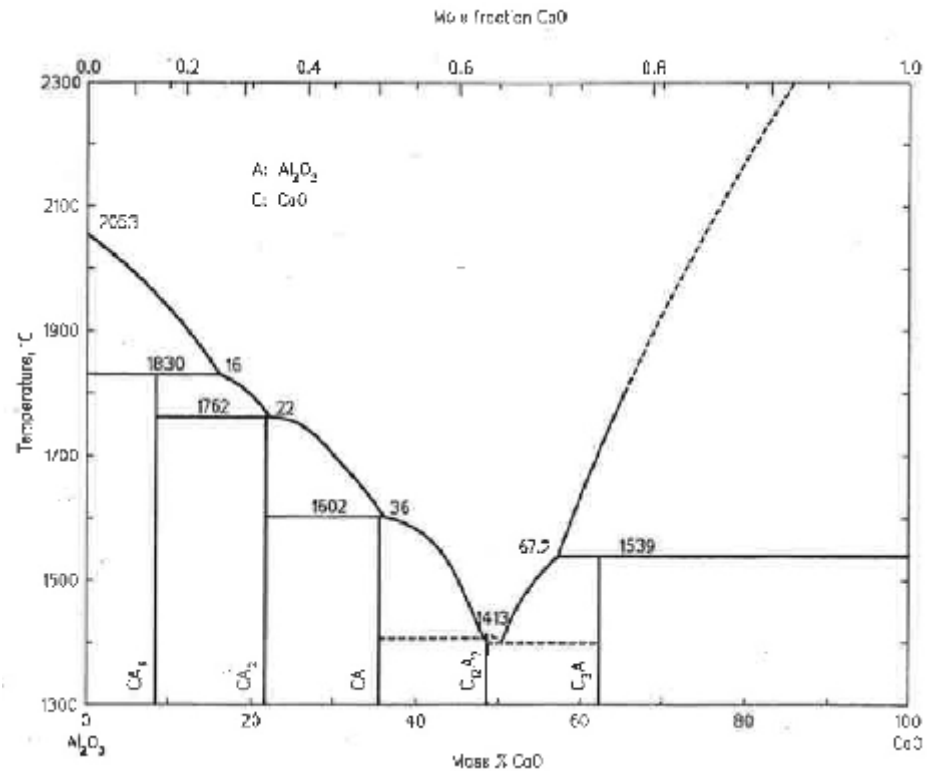
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- § High Alkali corrosion resistant insulating fire brick
- § Low thermal conductivity
- § High mechanical strength
- § Good mechanical machining
- § Economic production (process)

Calciumhexaaluminate - CA_6 : $CaO \times 6Al_2O_3$

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- § Most Alumina rich phase in the Al_2O_3 -CaO System
- § High refractoriness
- § High corrosion resistance



Source: Slag Atlas, Stahleisen; Auflage: 2, p.39

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Production

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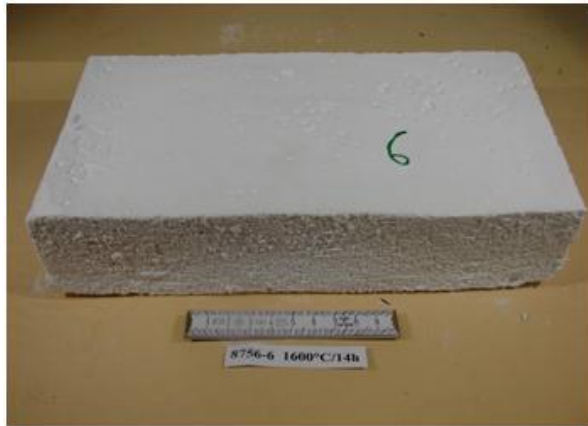
- § Classic process: Mixing, Casting, Drying, Firing, Finishing
- § Block casting process comparable with IFB production
- § Porosity is produced by water and foam
- § Goal: low raw material costs, very low thermal conductivity, high porosity, reliable technology



CA₆ sample after casting

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§ Firing at temperatures of 1550 – 1625°C, material sinters free of cracks

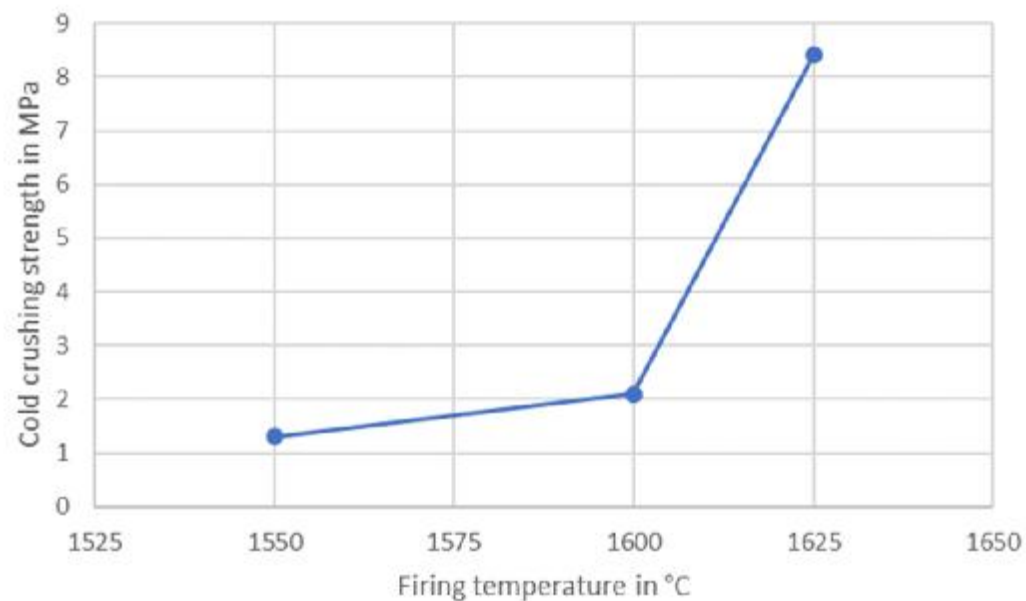


CA₆ brick 280x150x90 mm sample after firing at 1600°C



CA₆ block 600x400x100 mm after firing at 1625°C

Cold crushing strength

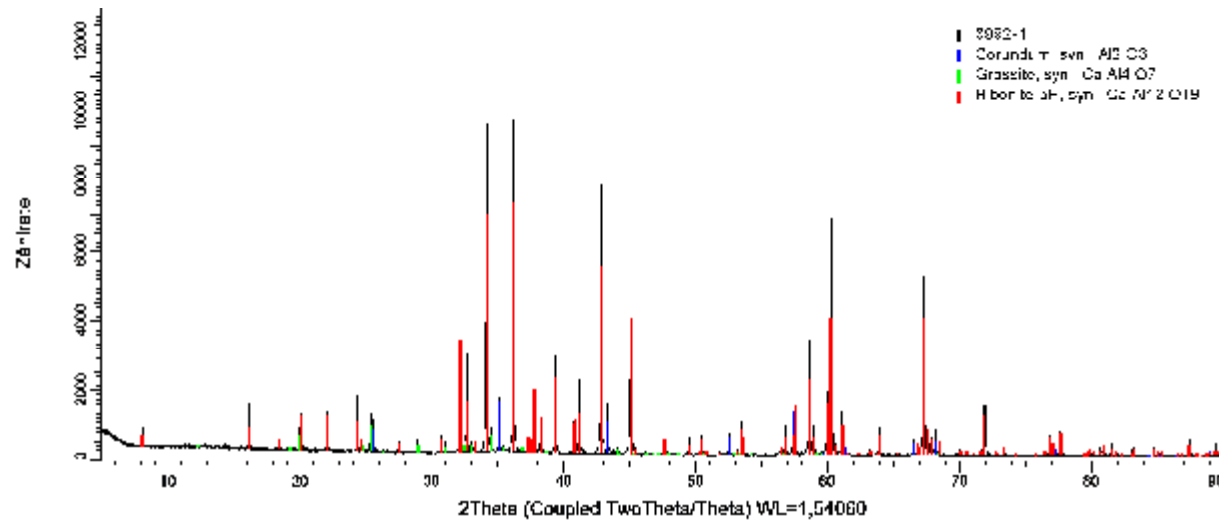


Firing temperature/time	CCS	Density	Firing shrinkage
1550 °C/ 4 h	1,3 MPa	780 kg/m ³	7,8 %
1600 °C/ 4 h	2.1 MPa	810 kg/m ³	8,9 %
1600 °C/ 8 h	2,1 MPa	820 kg/m ³	8,8 %
1625 °C/ 2 h	8,4 MPa	870 kg/m ³	9,3 %



Phase composition

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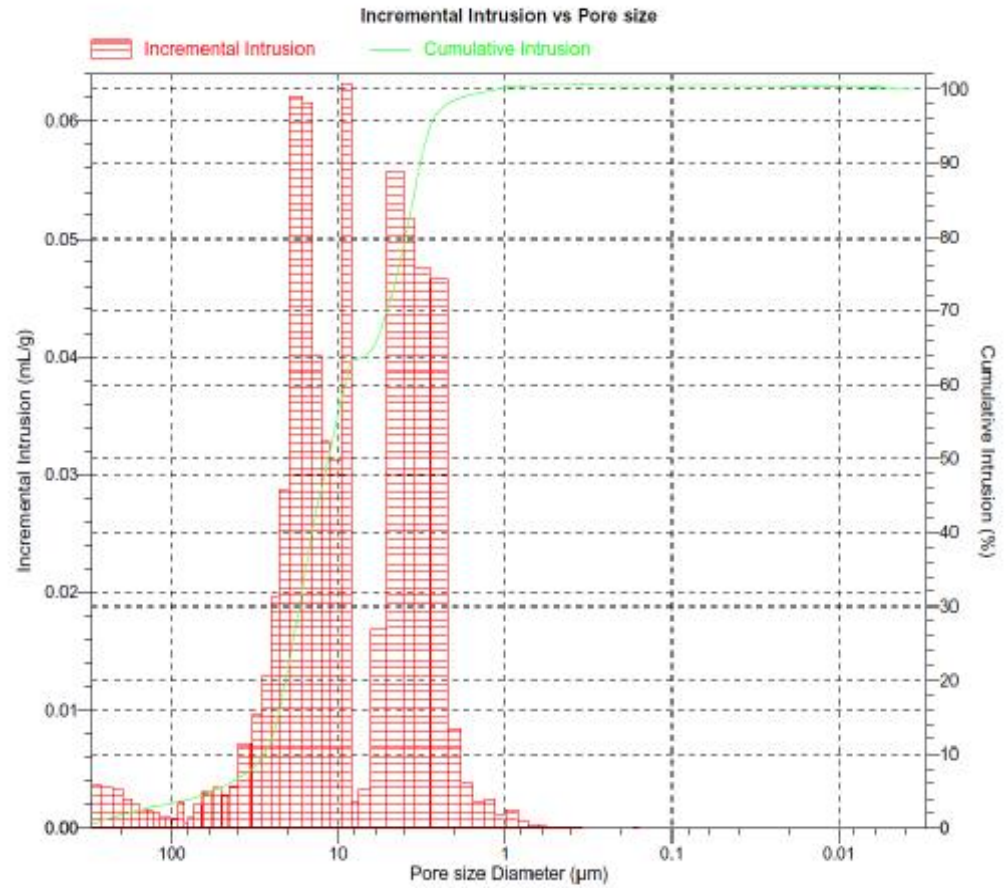
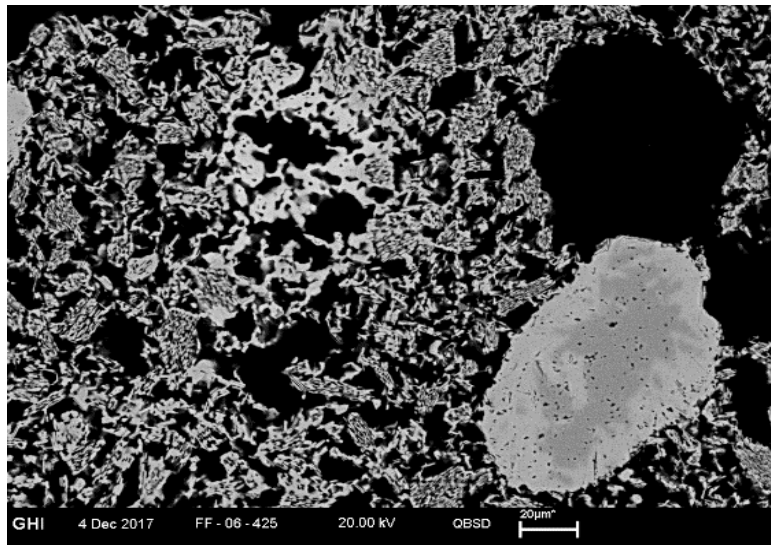
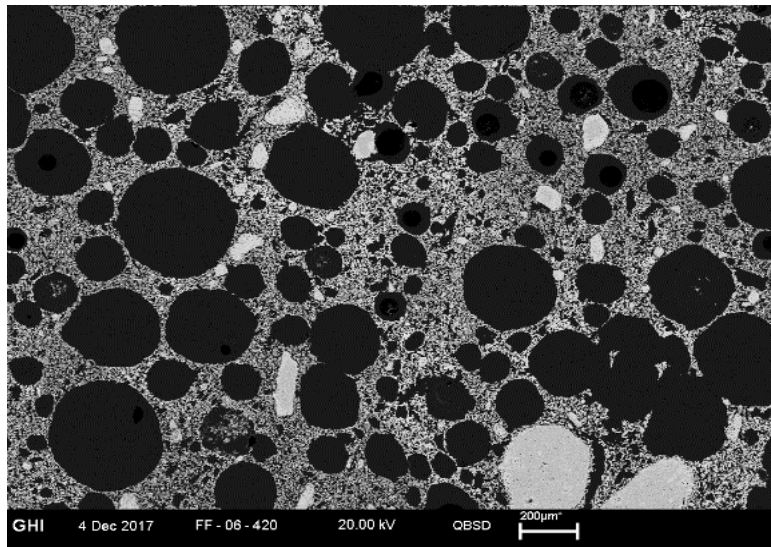


1625 °C, 2 h

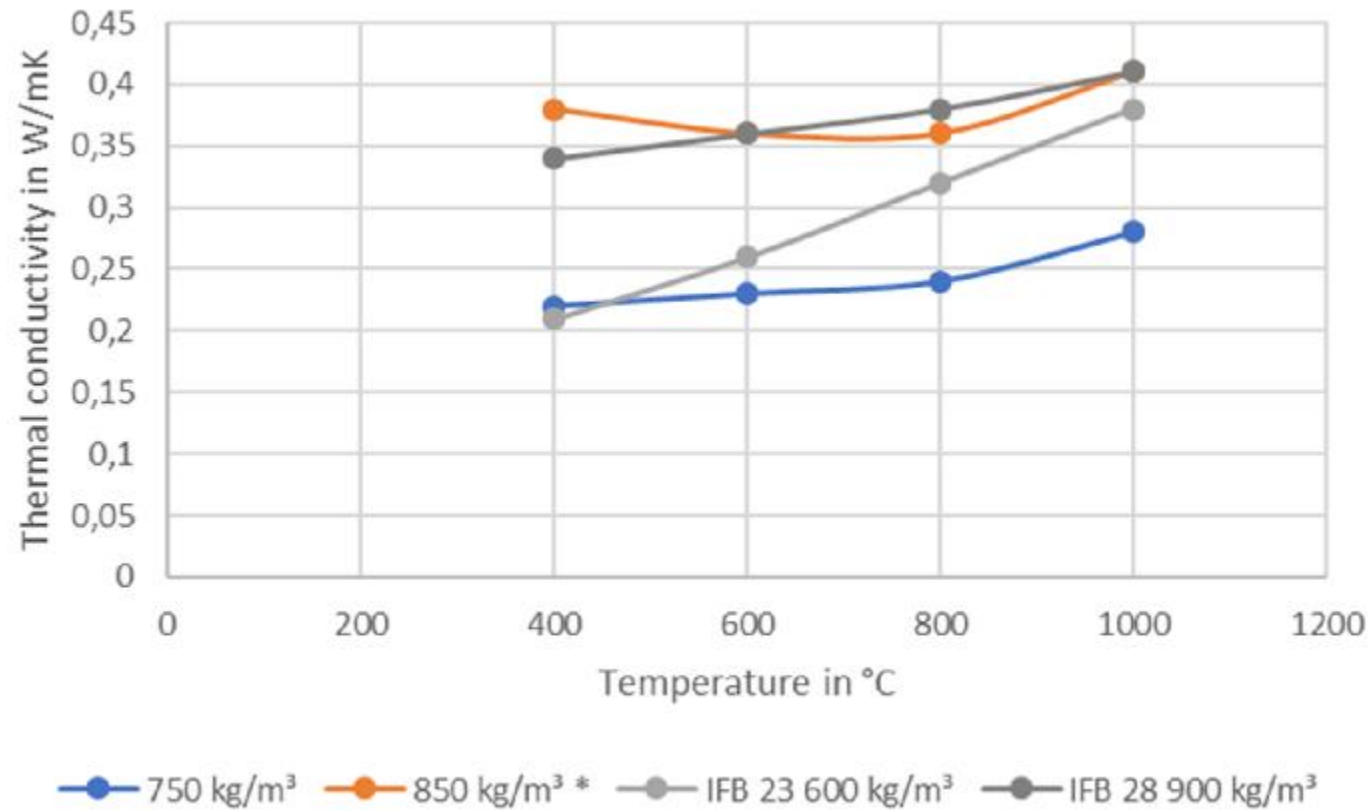
CA ₆	90 %
CA ₂	6 %
Corundum	4 %

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Pore size distribution

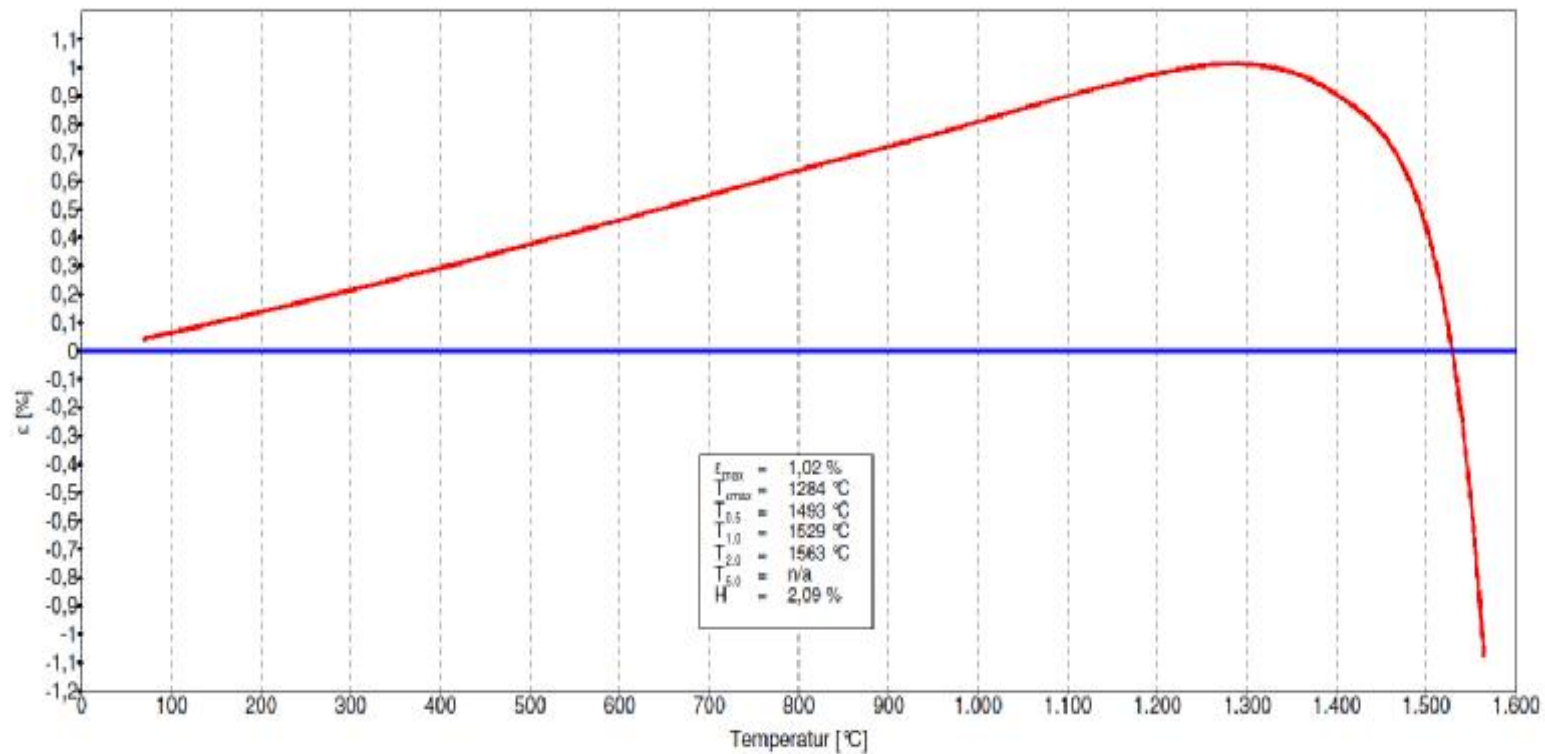


Thermal conductivity



Creep under compression

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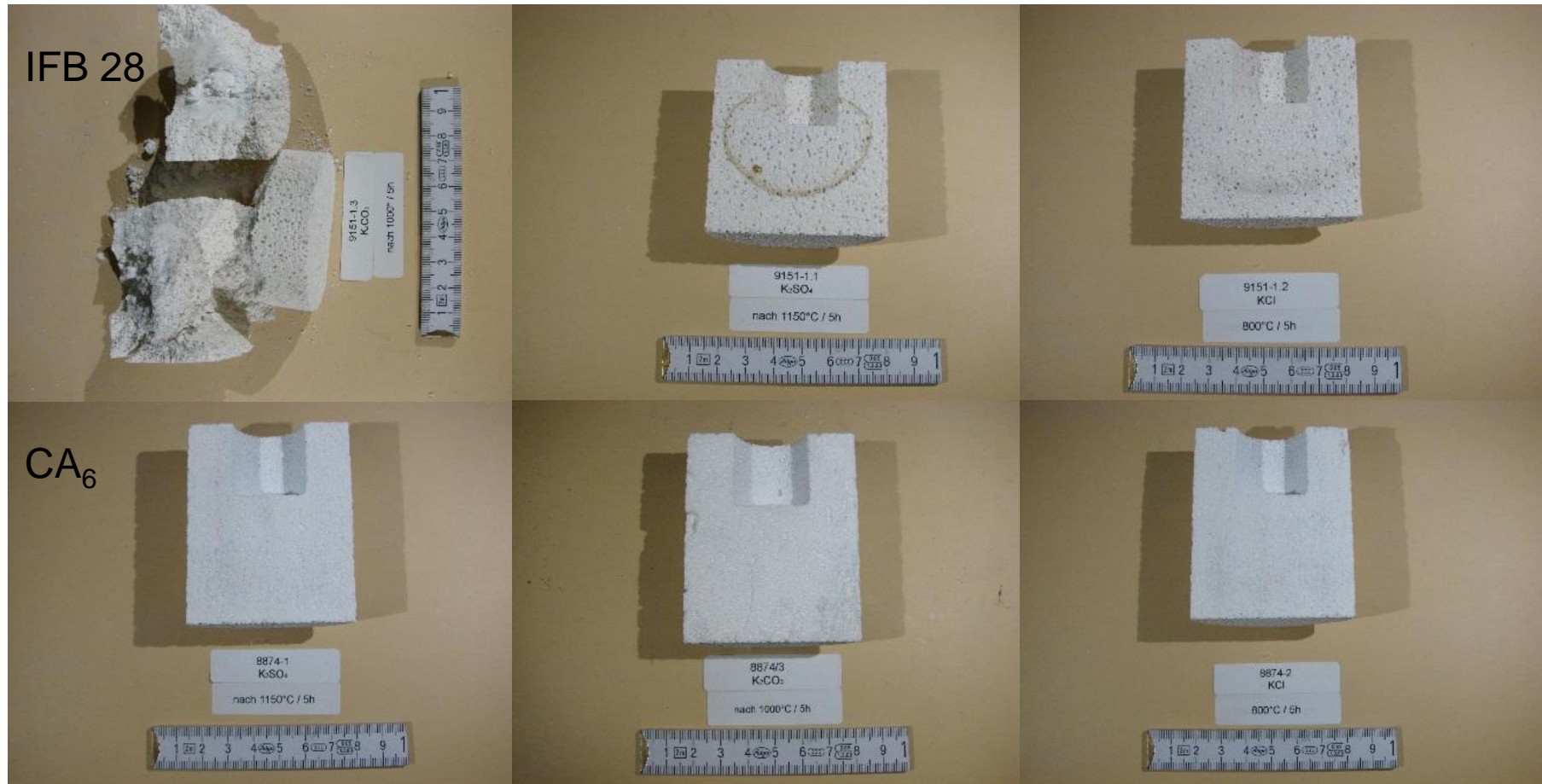
Alkali corrosion CA₆ / IFB 28

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K₂CO₃ after 1000 °C/5 h

K₂SO₄ after 1150 °C/5h

KCl after 800 °C/5h



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Technical data



Technical Data			
		CA ₆ - insulation block	
Bulk Density		750 kg/m ³	850 kg/m ³
Colour		white	
Classification temperature		(1600°C)	
Shrinkage (after 24h at 1550°C)		<1%	
Creep under compression T_{0,5}		1490°C	
Porosity		65 %	
Average pore size		~10 µm	
Reversible expansion		8.1x10 ⁻⁶ m/mK	
Thermal conductivity	400°C	0.22	0.38*
	600°C	0.23	0.36*
	800°C	0.24	0.36*
	1000°C	0.28	0.41*
Phase composition	CA6	90%	
	CA2	6%	
	Corundum	4%	
Corrosion resistance	KCl	yes	
	K ₂ SO ₄	yes	
	K ₂ CO ₃	yes	
max. Sizes (tested so far)			
Length		500 mm	
Width		350 mm	
Thickness		100 mm	



Applications

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- § Insulation and kiln furniture material for high temperatures
- § Corrosive environments (Alkaline)

- § Salt glaze kilns
- § Waste combustion
- § Heat treatment furnaces
- § Bio-mass combustion chambers

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