

PUBLIC JOINT-STOCK COMPANY
VOLZHSKY ABRASIVE WORKS



**HIGH PERFORMANCE REFRACTORIES
FOR INDUSTRIAL APPLICATION**



VOLZHSKY ABRASIVE WORKS

REFRACTORY PRODUCTION SHOP



- Five modern furnaces with a capacity of up to 20 MT each
- High-performance equipment
- Competent team of technologists and highly qualified professionals
- Flexible marketing

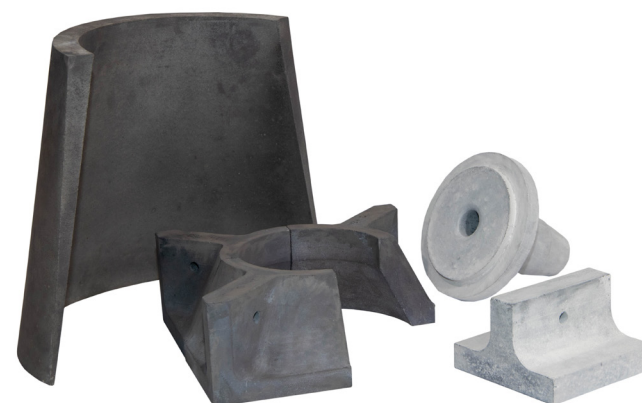
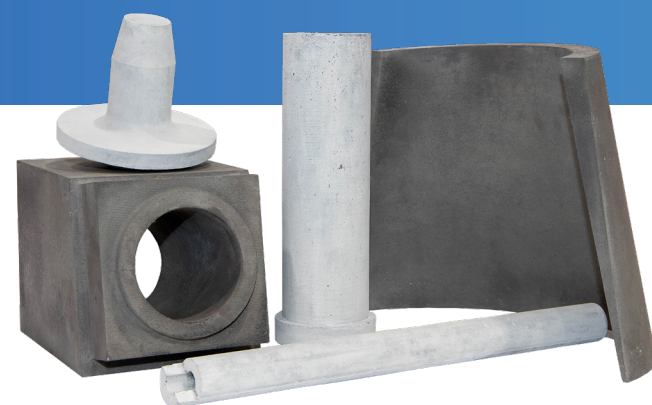


Volzhsky Abrasive Works (VAW) is one of the leading manufacturers of grinding materials and abrasive tools. It is the largest enterprise in the sector of black, green and electric silicon carbide crude production, manufacturing abrasive grains, grinding powders, bakelite-bonded and ceramic-bonded abrasive tools. VAW is highly automated, mechanized and computerized company.

VAW focuses on markets of abrasive tools, grinding materials and refractory products. The technological basis of production is fusion and processing of black and green silicon carbide of own production used in the abrasive, refractory and metallurgical industries.

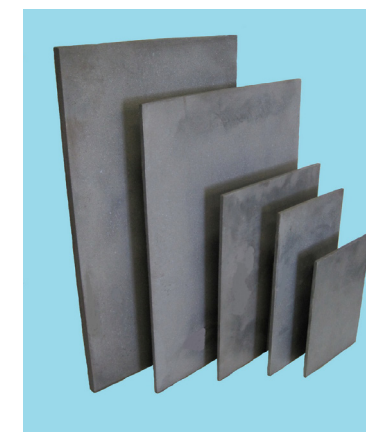


PJSC "Volzhsky Abrasive Works" produces molded oxide-bonded and nitride-bonded silicon carbide refractories, as well as silicon carbide castables or refractories containing silicon carbide. Due to high refractoriness and thermal conductivity, oxide-bonded refractories are used in high-temperature firing of whiteware, abrasive products, various ceramics at temperatures up to 1450 °C. Nitride-bonded refractories have high oxidation resistance, good resistance to acids; they are non-wettable by non-ferrous metal melts. These characteristics make them applicable for lining of electrolysis cells for primary aluminum production, in furnaces for electric melting of copper and zinc. Nitride-bonded refractories are also used for lining of blast furnaces and ferroalloy furnaces, as guides in annealing furnaces.



NITRIDE-BONDED REFRACTORIES

2



PLATES

For porcelain and abrasive tools manufacturers

1



GUIDES

Products for various heat treatment furnaces

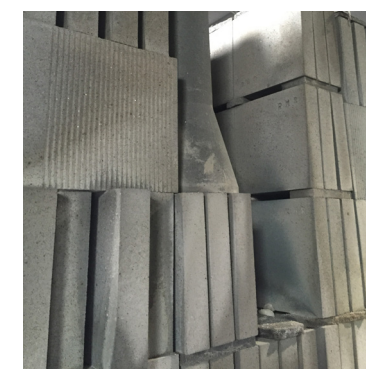
3



COMPLEX-SHAPED PRODUCTS

Products for boilers and waste incineration plants

4



FOR ELECTROLYSIS CELLS

Products for lining of electrolysis cells of aluminum smelters



SPECIFICATION FOR NITRIDE-BONDED SILICON CARBIDE REFRACTORIES OF KN GRADE (GOST 10153-70)

NITRIDE-BONDED SILICON CARBIDE PRODUCTS HAVE HIGH QUALITY CHARACTERISTIC:

Parameter	UOM	Parameter value		Control method
		standardized	typical	
Weight of SiC	%	≥ 70	72	LECO ISO 21068-2 XRD
Weight of Si (free)	%	≤ 1.5	0.5	ISO 21068-2 XRD
Weight of Si ₃ N ₄ N ₂	%	n/a ≥ 7	21 8.4	LECO
Bulk density	kg/m ³	n/a	2.63	ISO 5017
Apparent porosity	%	≤ 19	14.1	ISO 5017
Cold crushing strength at room temperature	MPa	≥ 100	161	ISO 10059-2
Modulus of Rupture at room temperature	MPa	n/a	34	ISO 5014
Initial deformation temperature under load*	°C	≥ 1500	≥ 1750	GOST 4070 ISO 1893
Residual dimensional changes when heated up to 1000 °C*	%	n/a	≤ 0.1	ISO 2478
Linear thermal expansion coefficient (in the range up to 1000 °C)*	–	n/a	≤ 4.6·10 ⁻⁶	DIN 51045
Thermal conductivity*:				
– at 900 °C (laser flash method)	W/m·K	n/a	≥ 20	ISO 8894-2 DIN 51936
– at 600 °C (laser flash method)	W/m·K	n/a	≥ 28	

* – this parameter is determined from time to time and/or at the customer's request.

KN products of simple shape, for example guides, are manufactured by vibro-impact molding.

- low porosity;
- high compressive, tensile and bending strength;
- no deformation under load when heated up to 1800 °C;
- low oxidation at 1600 °C in air;
- low gas permeability;
- high resistance to alternating mechanical stress;
- high thermal resistance;
- good resistance to acids;
- non-wettability by non-ferrous metal melts;
- high thermal conductivity;
- insignificant change of dimensions at heating up to 1000 °C;
- high abrasion resistance.

The main field of application of these products is the production of non-ferrous metals. A large part is used in the lining of aluminum electrolysis cells for primary aluminum production. These products are also used during production of other non-ferrous metals, for instance, in shaft furnaces for copper and zinc production. Dimensions of nitride-bonded refractory blocks:
from 320×160×60 mm
to 700×300×60 mm

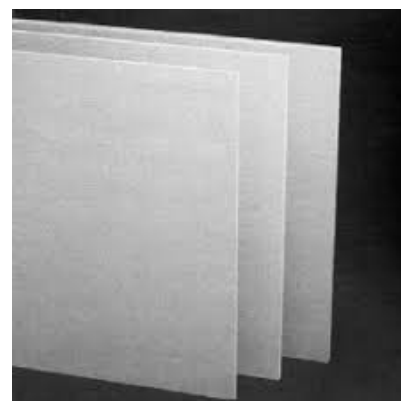


OXIDE-BONDED REFRACTORIES



1 PLATES

For porcelain and abrasive tools manufacturers



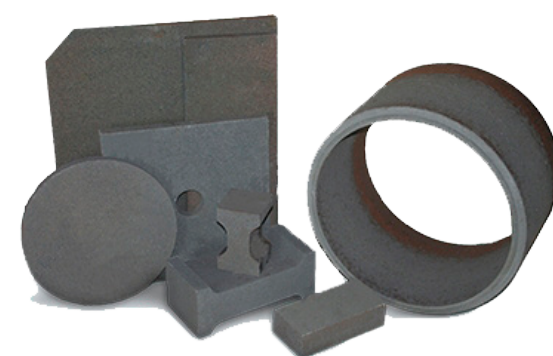
2

ENGOBED PLATES

For special cleanliness of the finished product

ENGOBE

- firmly adheres to the surface of the plate
- cannot be washed off with water
- ensures cleanliness of the product
- non-sticky
- no need for filling



3 SHAPED PRODUCTS

For repairs of furnaces, trolleys and special applications

OXIDE-BONDED REFRACTORIES

Volzhsky Abrasive Works produces refractories made of mullite siliceous-bonded silicon carbide (operating temperature of products 1300-1450 °C) and aluminosilicate-bonded silicon carbide (up to 1300 °C). They are used in heat treatment of whiteware and ceramic-bonded abrasive tools in furnaces of different types.

It is possible to produce silicon carbide refractories of other shapes and sizes according to drawings agreed with the consumer.

SILICON CARBIDE REFRACTORIES ARE AVAILABLE IN THE FOLLOWING GRADES DEPENDING ON THE TYPE OF BONDING:

KMK – mullite siliceous-bonded silicon carbide products;

KA – aluminosilicate-bonded silicon carbide products;

KAS – aluminosilicate-bonded silicon carbide products for high-speed kilns.

Refractories are manufactured in accordance with GOST 10153-70 and STO 00220931-021-2011 "Silicon carbide refractory products. Technical conditions".



VOLZHSKY ABRASIVE WORKS –
MOVING FORWARD!



UNSHAPED REFRACTORIES

1

VAZRAM

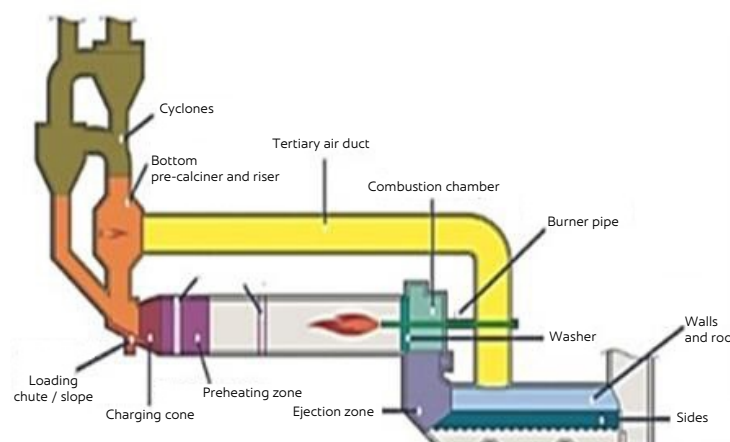
Ramming mass with high alumina cement-bonded silicon carbide aggregate (weight of SiC not less than 85 %), designed for filling sub-flange gaps and performing hot repairs.



2

VAZCONCRETE

Concrete mix with high-alumina cement-bonded silicon carbide aggregate, designed for repairs of rotary kiln lining and related units of cement industry, levelling of shells of electrolysis cells, other thermal units, including non-ferrous metallurgy.



3

VAZMERT

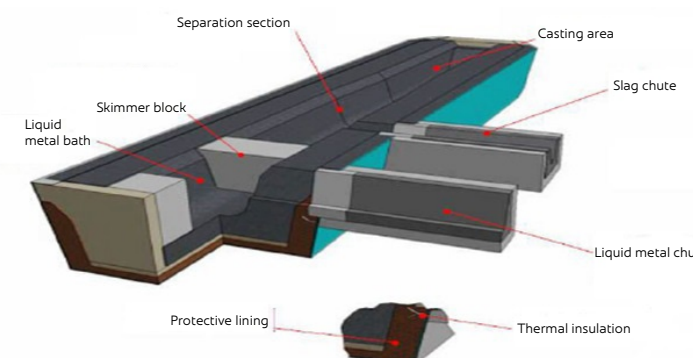
Mortar with high-alumina cement-bonded silicon carbide aggregate (weight of SiC not less than 85 %) is designed for bonding of silicon carbide plates to the shell of electrolysis cell, as well as to other thermal units of non-ferrous metallurgy and for joining silicon carbide blocks to each other.



4

VAZCAST

Concrete mix with high alumina cement-bonded silicon carbide and fused alumina aggregate, designed for casting chutes, oscillating chutes of blast furnace (BF) cast house.



PHYSICAL AND CHEMICAL PARAMETERS OF REFRACTORY CONCRETE VAZCONCRETE-15SIC

No.	Parameter	UOM	Parameter value		Control method
			standardized	typical	
1	Weight: SiC Al ₂ O ₃ CaO	%	12–17 min 68 max 2.5	14.1 70.3 1.4	Wet chemical meth. GOST 26564.1 GOST 2642.4 GOST 2642.7
2	Bulk density after heat treatment at 1000 °C	g/cm ³	≥ 2.55	2.98	GOST 2409 ISO 5017-88
3	Linear shrinkage after the following heat treatment modes: 1000 °C	%	-0.3 to +0.3	-0.2	GOST 31175 ISO 13765-4:2004
4	Cold crushing strength at room temperature after the following heat treatment modes: 110 °C 1000 °C	MPa	≥ 65 ≥ 85	117 98	GOST 4071.1 ISO 10059-2 ISO 13765-4:2004
5	Maximum grain size*	mm	n/a	6	
6	Maximum operating temperature*	°C	n/a	1600	
7	Water requirement*	%	4.0–5.5	4.75	DIN EN ISO 1927-4:2012

* – reference indicator, not controlled

PHYSICAL AND CHEMICAL PARAMETERS OF REFRACTORY CONCRETE VAZCONCRETE-40SIC

No.	Parameter	UOM	Parameter value		Control method
			standardized	typical	
1	Weight: SiC Al ₂ O ₃ CaO	%	38–43 min 45 max 2.5	41.1 49.5 1.3	Wet chemical meth. GOST 26564.1 GOST 2642.4 GOST 2642.7
2	Bulk density after heat treatment at 1000 °C	g/cm ³	≥ 2.45	2.88	GOST 2409 ISO 5017-88
3	Linear shrinkage after the following heat treatment modes: 1000°C	%	-0.3 to +0.3	-0.2	GOST 31175 ISO 13765-4:2004
4	Cold crushing strength at room temperature after the following heat treatment modes: 110 °C 1000 °C	MPa	≥ 65 ≥ 85	112 102	GOST 4071.1 ISO 10059-2 ISO 13765-4:2004
5	Maximum grain size*	mm	n/a	6	
6	Maximum operating temperature*	°C	n/a	1600	
7	Water requirement*	%	4.5–6.0	4.75	DIN EN ISO 1927-4:2012

* – reference indicator, not controlled

SPECIFICATIONS FOR VAZCAST DP

No.	Parameters	UOM	Standard values	Regulatory documentation for test methods
			VAZCAST DP	
1	Weight of Al ₂ O ₃ (on ignition basis), min	% wt.	62	GOST 2642.4
2	Weight of CaO (on ignition basis), max	% wt.	2.1	GOST 2642.7
3	Maximum grain size, max	mm	10	GOST 27707 GOST R 52667
4	Cold crushing strength after heat treatment at 1000 °C, min	N/mm ²	60	GOST 4071.1
5	Bulk density after heat treatment at 1000 °C, min	%	2.75	GOST 2409 GOST R 52541

SPECIFICATIONS FOR VAZMERT

No.	Parameter	UOM	Parameter value
1	Weight of SiC, min	%	85.0
2	Bulk density after heat treatment of samples at 1000 °C, min	g/cm ³	2.0
3	Adhesion strength after the following heat treatment modes, min: 100 °C 1000 °C	MPa	3.5 3.0
4	Thermal conductivity at 1000 °C	W/m*K	5.0
5	Grain-size composition: residue on 0.4 mm sieve, max passage through 0.075 mm sieve, min	%	1.0 50.0

