



ANTIOXIDANTS FOR CARBON-BONDED REFRACTORIES

Carbon in refractory materials improves thermal shock resistance, protects against wetting from metals and slag, and requires extra protection from oxidation. Carbon bonded refractories have the best chemical resistance against molten steel. However they are sensitive to oxidation.



Grains and powders



Zirconium diboride – ZrB_2 1-3 mm

Application

Metallic additives are very common but ceramic antioxidants (boron carbide, calcium hexaboride and zirconium diboride) are proven more effective.

When TETRABOR® Boron Carbide is oxidized, an interaction occurs with the matrix material to form liquid and/or gaseous phases protecting the carbon from oxidation, thereby prolonging the service life of carbon-bonded refractory materials.

Calcium hexaboride is primarily used for carbon-bonded MgO based bricks and monolithics in the steel making processes.

Zirconium diboride is the best additive for improving corrosion resistance in zirconia based carbon-bonded refractories

coming into contact with ferrous melts, e.g. submerged entry nozzles.

Chemistry (typical values)

B_4C	
B + C	> 95 %
C_{free}	< 4 %
N	< 2 %
CaB_6	
Ca + B	> 90 %
C	< 6 %
ZrB_2	
Zr + B	> 95 %
C	< 1,5 %



Calcium hexaboride – CaB₆



TETRABOR® Boron Carbide – B₄C

Grain size distribution (typical values)

Particle size - 400 mesh	B ₄ C	CaB ₆	ZrB ₂
3%-value (min. 97 %)	< 56 µm	< 56 µm	< 56 µm
50%-value (average)	3 – 15 µm	9 – 17 µm	6 – 17 µm
94%-value (max. 6%)	< 1 µm	< 5 µm	< 5 µm

(Measured with laser diffractometer, Coulter LS 230)

Additional coarser or finer grain sizes on request.

Properties

Chemical formula				
	B ₄ C	CaB ₆	ZrB ₂	
Crystal structure				
	rhombohedral	cubic	hexagonal	
Molecular weight				
	g/mol	55.26	104.95	112.845
Specific gravity				
	g/cc	2.54	2.45	6.09
Melting point				
	°C	2,450	2,185	2,990
	°F	4,440	3,965	5,415
Hardness (Mohs scale)				
		9	8-9	8
Thermal expansion (20 -1000°C)*: K-1				
		5 · 10 ⁻⁶	6.5 · 10 ⁻⁶	6.6 · 10 ⁻⁶

* measured on dense shapes

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