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MATERIALS REFRACTORY MATERIALS

- Refractory Ceramics..... F 05

Refractory Ceramics

By definition, ceramics are non-metallic materials, inorganic, obtained by the action of high temperatures.

During firing a ceramic raw material undergoes an irreversible transformation and acquires new properties. These properties are well known : durability, wear and heat resistance.

Neyco provides a wide range of technical ceramics that will fit to all your specifications. We are able to produce a lot of ceramics parts on drawings or as per our standards dimensions (E-beam liners). Depending on your specifications, your usage constraints, work environment and the desired characteristics, we provide you with the most appropriate material for your application.



Alumina parts

MAIN PROPERTIES

- High hardness
- High temperature resistance
- Abrasion resistance
- Precision machining
- Suitable for polishing
- Low porosity
- Chemically inert
- High corrosion resistance

TYPES OF PRODUCTS

- Rectangular plates
- Discs
- Tubes & rods
- Crucible liners
- Boats
- Screws, nuts & bolts
- Substrates
- All parts according specific drawings

 See Section H in this catalogue about *crucible and liners*

OXIDES

STANDARD SPECIFICATIONS

	ALUMINA	ZIRCONIA OXIDE		QUARTZ
	Al ₂ O ₃ (99.7%)	ZrO ₂ /MgO	ZrO ₂ /Y ₂ O ₃	SiO ₂
Colour	White	Yellow	White	Clear
MECHANICAL PROPERTIES				
Hardness (Mohs)	9	6.5	6.5	7
Young Modulus (GPa)	300 - 400	200	220	70
Max use temperature (°C) in air	1750	1200	1000	1200
Melting Point (°C)	2050	1200	1000	-
Density (g/cm ³)	3.9	5.5 - 5.9	6 - 6.7	2.21
Flexural strength, 3 points (MPa) at 20°C	250	360	540	80
Compressive strength (MPa) at 20°C	1800	3500	6000	650 - 1100
ELECTRICAL PROPERTIES				
Electrical resistivity (Ω.cm) at 20°C	10 ¹²	> 10 ¹⁰	> 10 ⁹	10 ¹⁸
Dielectric strength (kV/mm)	10 - 20	2 - 10	9	25 - 40
THERMAL PROPERTIES				
Thermal conductivity (W/m ⁻¹ .K ⁻¹) at 20°C	29	1.9	3	1.4
Linear expansion (x10 ⁻⁶ /K) 20°C to 1000°C	8.6	9	11	0.58

CARBIDES & NITRIDES

STANDARD SPECIFICATIONS

	CARBIDES		NITRIDES		
	Boron carbide	Silicon carbide	Boron nitride	Silicon nitride	Aluminum nitride
	B ₄ C	SiC	BN	Si ₃ N ₄	AlN
Colour	Grey, black	Black	White	Grey, black	Grey, white
MECHANICAL PROPERTIES					
Hardness (Mohs)	9.5	9 - 10	2	9 - 8	5 - 7
Young Modulus (GPa)	450	420	20 - 100	315	318
Max use temperature (°C) in air	600 - 800	1500	1200	1500	1200
Melting Point (°C)	2460	2500	2600	1900	2200
Density (g/cm ³)	2.5	3.1 - 3.2	1.9 - 2.3	2.5 - 3.2	3.3
Flexural strength, 3 points (MPa) at 20°C		610	65 - 94	200	300
Compressive strength (MPa) at 20°C	1400 - 3400	1725 - 2500	143 - 186	1400	2000
ELECTRICAL PROPERTIES					
Electrical resistivity (Ω.cm) at 20°C	10 ³	10 ² - 10 ⁶	10 ¹⁴	10 ¹² - 10 ¹⁵	> 10 ¹⁴
Dielectric strength (kV/mm)	-	17	88	15	16 - 20
THERMAL PROPERTIES					
Thermal conductivity (W/m ⁻¹ .K ⁻¹) at 20°C	30 - 90	63 - 155	30 - 34	18	180
Linear expansion (x10 ⁻⁶ /K) 20°C to 1000°C	5.6	4 - 5	1 - 3	3 - 4	4.5 - 5.5

OTHER CERAMICS

STANDARD SPECIFICATIONS

	MULLITE	SILICON	MACOR®
	$\text{Al}_2\text{O}_3 + \text{SiO}_2$	Si	$\text{Al}_2\text{O}_3 + \text{SiC}$
Colour	White	Black, blue	White
MECHANICAL PROPERTIES			
Hardness (Mohs)	6 - 8	7	250 (Knopp, 100 g)
Young Modulus (GPa)	100	130	66.9
Max use temperature (°C) in air	1600	4800	1000
Melting Point (°C)	-	1414	-
Density (g/cm³)	2.7	2.33	2.52
Flexural strength, 3 points (MPa) at 20°C	120	210	94
Compressive strength (MPa) at 20°C	550	-	345
ELECTRICAL PROPERTIES			
Electrical resistivity ($\Omega\cdot\text{cm}$) at 20°C	10^{13}	-	10^{16}
Dielectric strength (kV/mm)	10	-	40
THERMAL PROPERTIES			
Thermal conductivity ($\text{W/m}^{\cdot}\text{K}^{\cdot}$) at 20°C	2 - 3.5	148	1.46
Linear expansion ($\times 10^{-6}/\text{K}$) 20°C to 1000°C	5.3 - 5.7	4.68	9.3 - 12.6



BN-TiB₂ boat source



BN-TiB₂ crucible



Ceramics machined parts



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