

3DMIX

BY 3DCERAM



**Ceramics
for 3D printing**

Technical datasheets

SILICORE DS/SX

✔ Properties

- ✔ High mechanical resistance
- ✔ Porous ceramic, good leachability
- ✔ Very stable at high temperature
- ✔ Compatible with complex shapes like cores
- ✔ Used with all alloys except cobalt

✔ Application

- ✔ Foundry cores



Available on C101 EASY and
C1000 FLEXMATIC

SILICORE DS/SX

		Values
Microstructure		
Silica/Zircon		80/20
Porosity	%	33
Mechanical properties at RT		
MOR 20°C	MPa	5
Impregnated MOR	MPa	20
General properties		
Cristobalite Content As fired : After 1530°C:	%	>8 >60
Roughness (Ra)	µm	3
Thermal expansion Thermal expansion	20- 1000°C	<0.2%
	20- 1525°C	<0.4%
Non contractual data for reference only - V24102019		

ALUMINIUM NITRIDE

✓ Properties

- ✓ High thermal conductivity
- ✓ Electrical insulation
- ✓ Good mechanical strength

✓ Application

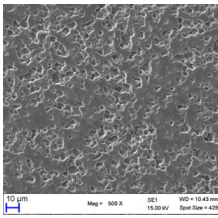
- ✓ Electronics industry



Available on C101 EASY, C900 FLEX



ALUMINIUM NITRIDE

			Values
Microstructure			
Densification rate		%	97
Density		g/cm ³	3.22
Grain size after sintering		µm	< 5
SEM picture			
Mechanical properties			
4-pt bending strength		MPa	270
Theorical Young modulus		GPa	368
Thermal properties from -50°C to 60°C			
Thermal conductivity at RT		W/m.K	163.1
Thermal expansion coefficient	at -50°C	10 ⁻⁶ .K ⁻¹	1.84
	at 20°C		2.89
	at 60°C		3.38
Non contractual data for reference only - V24102019			

SILICON NITRIDE

Silicon nitride is one of the hardest and most resistant ceramics.

✔ Properties

- ✔ Good resistance to thermal shocks
- ✔ Good resistance to wear
- ✔ Mechanical properties
- ✔ Low wetability against molten metals
- ✔ Good electrical insulation
- ✔ Resistance to corrosion (liquids and gas)

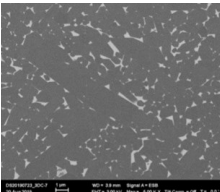
✔ Application

- ✔ Semi conductor
- ✔ Heating tubes
- ✔ Pump and valves components



Available on C101 EASY, C1000 FLEXMATIC, C3600 ULTIMATE & C900 FLEX

SILICON NITRIDE

			Values
Microstructure			
Densification rate		%	>97
Open porosity		%	<2.5
Density		g/cm ³	> 3.13
SEM picture			
Mechanical properties			
4-pt bending strength		MPa	881
Weibull modulus			11
Theorical Young modulus		GPa	290
Thermal properties from -50°C to 60°C			
Thermal conductivity at RT		W/m.K	23.6
Thermal expansion coefficient	at -50°C	10 ⁻⁶ .K ⁻¹	0.67
	at 20°C		1.23
	at 60°C		1.52
Non contractual data for reference only - V24102019			

SILICORE

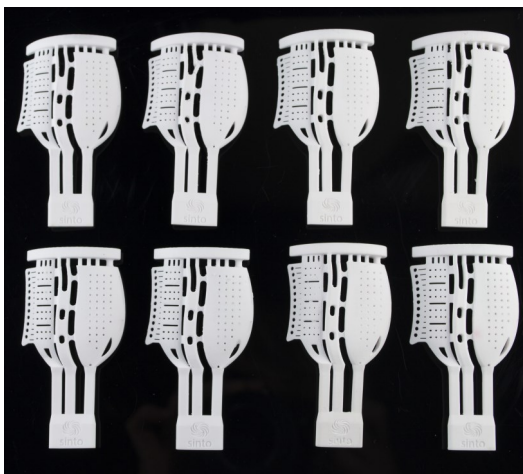
Silica based ceramic, our mix for foundry cores.

✓ Properties

- ✓ High mechanical resistance
- ✓ Porous ceramic, good leachability
- ✓ Very stable at high temperature
- ✓ Compatible with complex shapes like cores
- ✓ Used with all alloys except cobalt

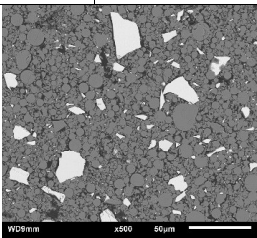
✓ Application

- ✓ Foundry cores



Available on C900 FLEX

SILICORE

		Values
Microstructure		
<i>Porosity can be adjusted according to customer's needs</i>		
Porosity	%	29
Density	g/cm ³	1.77
SEM picture		
Mechanical properties at RT		
3-pt bending strength	MPa	15.4
General properties		
Cristobalite content	%	69
Roughness (Ra)	µm	1.3
Dilatation max (RT - 1500°C)	%	1.42
Shrinkage max (1500°C)	%	0.20
Non contractual data for reference only - V24102019		

ALUMINA TOUGHENED ZIRCONIA

✓ Properties

The ceramic ATZ combines both Alumina (20%) and Zirconia (80%) ceramics in one. The mix of these two combined offers several properties :

- ✓ Great hardness and tenacity
- ✓ Biocompatibility
- ✓ Resistance to wear and thermal shock

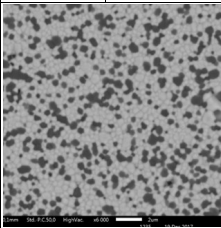
✓ Applications

- ✓ Implants
- ✓ Teeth
- ✓ Wear resistant parts



Available on C900 FLEX

ALUMINA TOUGHENED ZIRCONIA

		Values	
Microstructure			
Densification rate	%	>99	
Density	g/cm ³	>5.2	
Grain size after sintering	μm	<0.5	
SEM picture			
Mechanical properties			
4-pt bending strength	MPa	1094	
Weibull modulus		5.8	
Theorical Young modulus	GPa	220	
Thermal properties from -50°C to 60°C			
Thermal conductivity at RT		W/m.K	5,4
Thermal expansion coefficient	at -50°C	10 ⁻⁶ .K ⁻¹	7,50
	at 20°C		7,94
	at 60°C		8,33
Non contractual data for reference only - V19102018			

CORDIERITE

✓ Properties

The cordierite is a magnesium alumina silicate material and has different properties :

- ✓ Low CTE
- ✓ Low thermal conductivity
- ✓ Wear resistant
- ✓ Good for vacuum application

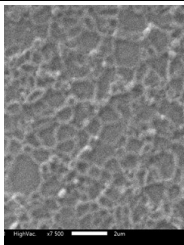
✓ Applications

- ✓ Optical parts for aerospace
- ✓ Metrology



Available on C900 FLEX

CORDIERITE

		Values	
Microstructure			
Densification rate		%	>98
Density		g/cm ³	>2.5
Grain size after sintering		µm	0.89
SEM picture			
Mechanical properties			
4-pt bending strength		MPa	150
Weibull modulus			6.5
Theorical Young modulus		GPa	140
Thermal properties from -50°C to 60°C			
Thermal conductivity at RT		W/m.K	3.8
Thermal expansion coefficient	at -50°C	10 ⁻⁶ .K ⁻¹	-0.87
	at 20°C		-0.10
	at 60°C		0.22
Non contractual data for reference only - V19102018			

ZIRCONIA 8Y

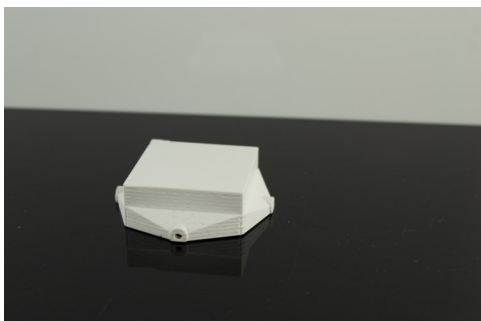
For non medical use

✓ Properties

- ✓ Ionic conductivity
- ✓ Oxygen-ion conductivity
- ✓ Heat insulating

✓ Applications

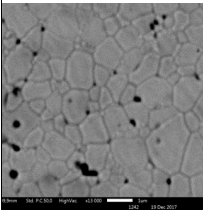
- ✓ Fuel cell



Available on C101 EASY,
C1000 FLEXMATIC & C900
FLEX

ZIRCONIA 8Y

For non medical use

		Values
Microstructure		
Densification rate	%	>99
Density	g/cm ³	5.79
Grain size after sintering	µm	0.73
SEM picture		
General Properties		
Ionic conductivity	σ T = 17S.cm-1.K (T = 800°C) σ T = 3S.cm ⁻¹ .K (T = 600°C)	
Non contractual data for reference only - V19102018		

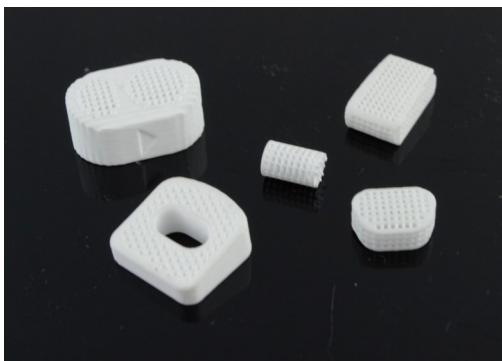
TRICALCIUM PHOSPHATE

✔ Properties

- ✔ Biocompatible
- ✔ Bioresorbable

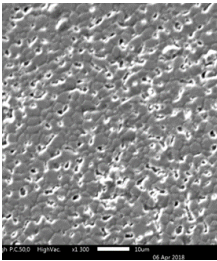
✔ Applications

- ✔ Implants



Available on C101 EASY, C900
FLEX

TRICALCIUM PHOSPHATE

		Values
Microstructure		
Density can be adjusted according to customer's needs		
Densification rate	%	80.7
Density	g/cm ³	2.47
Grain size after sintering	µm	2.8
SEM picture		
General Properties		
- Presence of hydroxyapatite measured by X ray diffraction bewteen 0% and 5%. - No calcium pyrophosphate seen by infrared analysis. - Ca/P ratio =1.503		
Non contractual data for reference only - V19102018		

FUSED SILICA



Properties



Good leachability



Applications

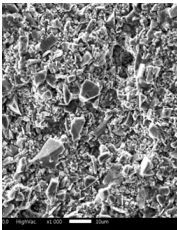


Foundry cores



Available on C900 FLEX

FUSED SILICA

		Values
Microstructure		
Porosity can be adjusted according to customer's needs		
Porosity	%	40
Density	g/cm ³	1.36
SEM picture		
Mechanical properties at RT		
3-pt bending strength	MPa	16.7
General Properties		
Cristobalite content (mass)	%	2
Roughness (Ra)	µm	1.3
Dilatation max (RT -1500° C)	%	0.07
Shrinkage before 1500°C	%	4.61
Shrinkage at 1500°C	%	0.11
Non contractual data for reference only - V19102018		

ZIRCONIA 3Y

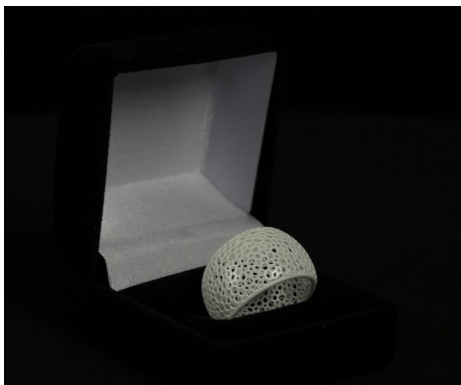
For non medical use

✓ Properties

- ✓ Excellent mechanical properties
- ✓ Chemical inertness
- ✓ High hardness

✓ Applications

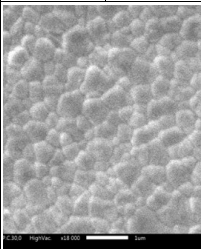
- ✓ Jewelry
- ✓ Watches
- ✓ Biomedical devices
- ✓ Biomedical implants
- ✓ Electronic equipment



Available on C101 EASY,
C1000 FLEXMATIC & C900
FLEX

ZIRCONIA 3Y

For non medical use

		Values
Microstructure		
Densification rate	%	>99.5
Density	g/cm ³	>5.95
Grain size after sintering	μm	<0,5
SEM picture		
Mechanical properties		
4-pt bending strength	MPa	950
Weibull modulus		9
Theorical Young modulus	GPa	200
Vickers hardness	GPa	12.6
Shear modulus	GPa	79.8
Compressive strength	MPa	2070
Thermal properties from -50°C to 60°C		
Thermal conductivity at RT		W/m.K 3.3
Thermal expansion coefficient	at -50°C	8.59
	at 20°C	10 ⁻⁶ .K ⁻¹ 9.10
	at 60°C	9.34
Non contractual data for reference only - V19102018		

HYDROXYAPATITE

✓ Properties

- ✓ Biocompatibility
- ✓ Excellent bioactivity
- ✓ Good osseointegration

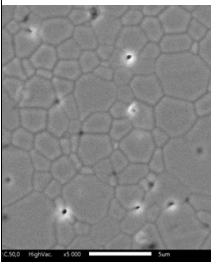
✓ Applications

- ✓ Tibial osteotomy wedges
- ✓ Intervetebraal cages
- ✓ Cranial implants
- ✓ Bone substitute
- ✓ Spine implants
- ✓ Orthopedic implants



Available on C101 EASY, C900 FLEX

HYDROXYAPATITE

		Values
Microstructure		
Densification rate	%	>96
Density	g/cm ³	>1.5
Grain size after sintering	μm	2
SEM picture		
Mechanical properties		
4-pt bending strength	MPa	107
General Properties		
Ca/P ratio		1.65 to 1.82
Foreign phases (CaO, TCP, alpha, TCP beta, TTCP)	%	≤5
Cristallinity	%	>95
Heavy metals	ppm	<30
Non contractual data for reference only - V19102018		

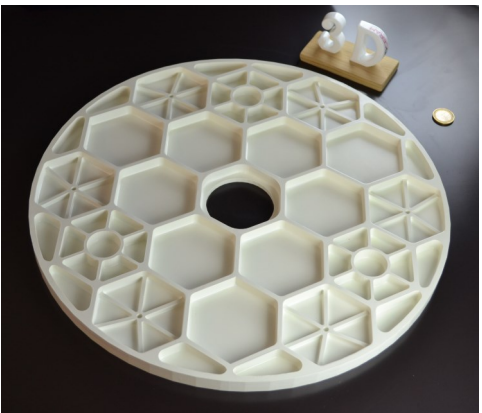
ALUMINA

✓ Properties

- ✓ Good mechanical strength
- ✓ Good thermal conductivity
- ✓ High electrical resistivity
- ✓ High hardness
- ✓ Good wear resistant
- ✓ Chemically inert

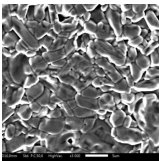
✓ Applications

- ✓ Electrical insulators
- ✓ Laboratory devices
- ✓ Telecommunication equipment
- ✓ Electronical devices
- ✓ Spatial
- ✓ Foundry cores
- ✓ Optical instruments

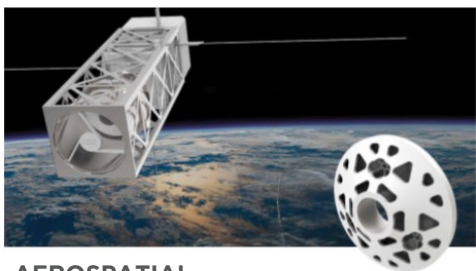


Available on C101 EASY, C900 FLEX, C3600 ULTIMATE & C1000 FLEXMATIC

ALUMINA

		Values	
Microstructure			
Density		g/cm ³	>3.9
Grain size after sintering		μm	2.2
SEM picture			
Mechanical properties			
4-pt bending strength		MPa	397
Weibull modulus			14.9
Theorical Young modulus		GPa	300
Vickers hardness		GPa	16.4
Fracture toughness		MPa.m ^{1/2}	4
Thermal properties from -50°C to 60°C			
Thermal conductivity at RT		W/m.K	23.3
Thermal expansion coefficient	at -50°C	10 ⁻⁶ .K ⁻¹	3.74
	at 20°C		4.98
	at 60°C		5.51
Non contractual data for reference only - V19102018			

OUR SERVICES



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FOUNDRY CORES



BIOMEDICAL