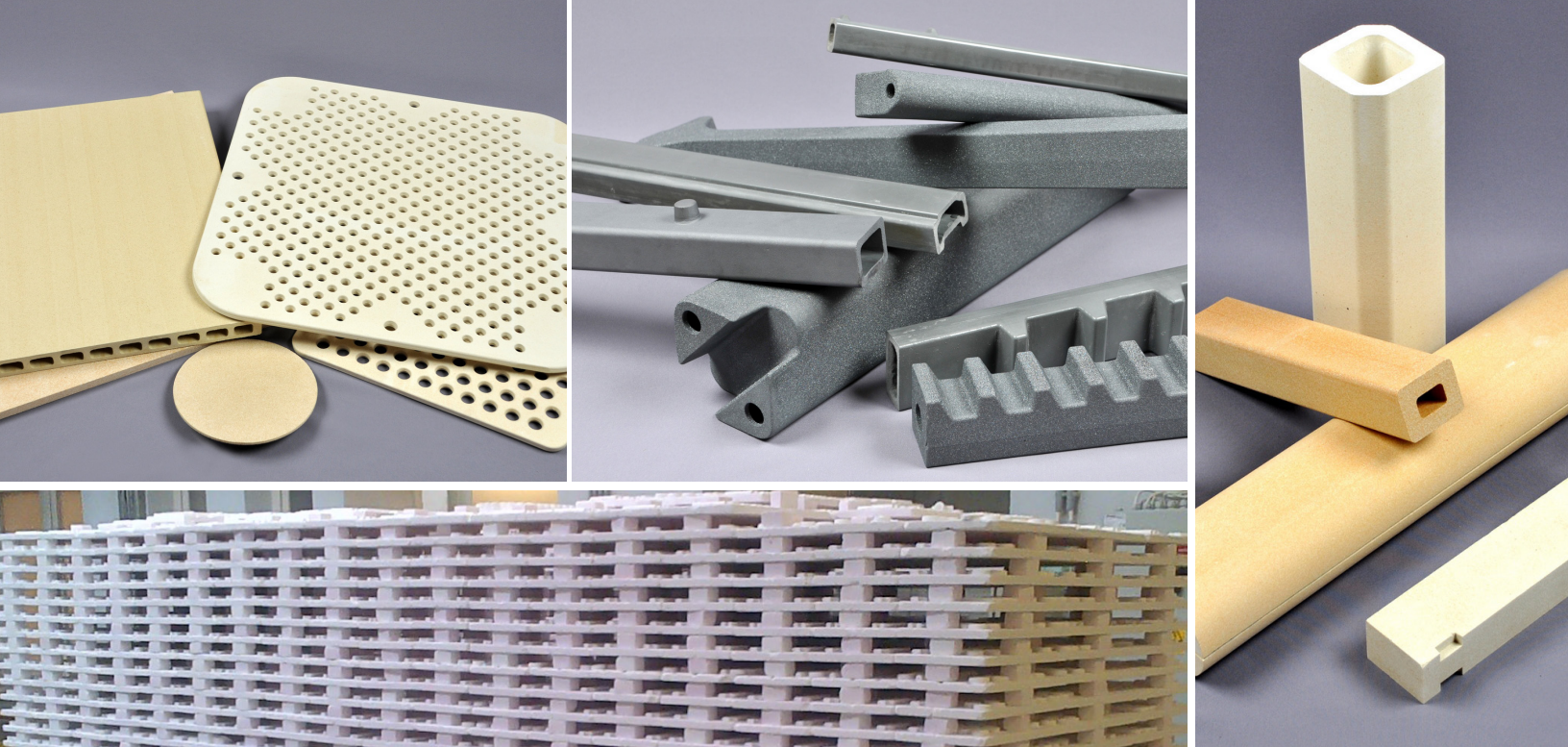




Creativity & performance in Technical Ceramics Kiln Furniture

Leveraging on its expertise in designing, composing, shaping and firing ceramics, **Imerys Ceramics** develops kiln furniture solutions for a wide range of technical ceramics manufacturings.

These kiln furniture solutions are designed to fit the needs of several industries:

- car
- electrical/electronics
- medical
- wear parts

Our wide range of high quality body compositions (silicon carbide, cordierite, mullite, alumina and zirconia) is a solid cornerstone to the custom-building of the required kiln furniture properties.

Each solution is tailored to your needs thanks to our state-of-the-art design office.

VALUE-ADDED PRODUCTS

Imerys Ceramics kiln furniture offers a large range of solutions for box-saggars :

- traditional with high performances
- combinaison of lib and ring – called “combo” - to increase flexibility and life time
- with specified “insert” to maintain pieces in right position during firing and keep the fired dimensions or avoid bending
- stackable setters with tailored ribs for product positioning



CASTED BOX SAGGARS

Material: RSiC



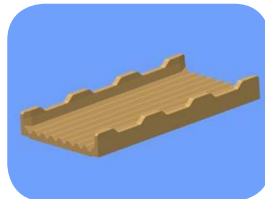
LIBS AND RING SAGGARS

Material: mullite/alumina



CASTED OR PRESSED BOX SAGGARS

Material: cordierite/mullite



PRESSED SETTERS

Material: cordierite/mullite or mullite/alumina



PRESSED BOX SAGGARS

Material: mullite/alumina



STACKABLE, COVERED BOX SAGGARS

Material: mullite/alumina

We have a wide range of standard dimensions of kiln furniture, and we produce all dimensions on request. We can also provide specific formulations as cordierite/spinel of kiln furniture depending on your needs. For all specific inquiries, we are used to work with Non Disclosure Agreements.

Imerys Ceramics kiln furniture offers a large range of solutions for batts and beams/props to build your own firing structure. We are extremely sensitive to provide you :

- low and very low thermal mass
- very precise and stable geometric dimensions
- long life-time
- high resistance to loading



PRESSED OR EXTRUDED BATTS

Material: cordierite/mullite or mullite/alumina or alumina



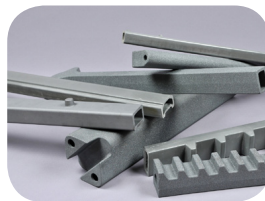
TUBS AND PROPS

Material: cordierite/mullite or mullite/alumina



CASTED BATTS

Material: RSiC



BEAMS

Material: RSiC or NSiC or SiSiC

Ask us for all any new specific need related to dimensions. Thanks to the most advanced shaping process, we will provide you a tailor-made solution. We are used to work with Non Disclosure Agreements.

FULL EXPERTISE

APPLICATIONS		BUILDING	ELECTRICAL			AUTOMOTIVE		
Fired parts	MATERIALS	Stoneware Cordierite	Cordierite	Steatite	Alumina	Cordierite	Alumina	RSiC
	TYPICAL PARTS	Chimney tubs & pipes	Heating supports	Connectors, fuses, insulating components		Catalyst supports	Spark-plugs	Diesel particle filters
	MAXIMUM TEMPERATURE (°C)	1300	1350		1650	1450	1650	1450
Our kiln furniture solutions	BATTS	Cormull C1E Aptakorit CME Aptakorit CM1 Aptakorit LS	Cormull C1E Aptakorit CME Aptakorit CM1 Aptakorit LS	Cormull C1E* Aptakorit CME* Aptakorit CM1* Aptakorit LS* Aptakarb 70* SC 100 RG*	Aptakor 80 Aptakor 85 Aptakor 99 SC 100 RG*	SC 100 RG	-	Aptasinit
	BOX & RING-SAGGARS	-				-	Aptakor 85 Aptamull HT	-
	PUSHER BATTS	Aptakorit CM1			Aptakor 85	-	-	-
	BEAMS	SC 90S - Aptasinit			SC 100 RG	Aptasinit SC 100RG	-	-
	PROPS - LEGS - PINS - SPACERS	Cormull C1E - Aptakorit CME - Aptakorit CM1			Aptakor 85 Aptamull HT SC 100 RG	Aptasinit SC 100 RG		Aptamull 84
	INSERTS	-					Aptamull 84	-

* : mullite coated

APPLICATIONS		CATALYST FILTRATION	GRINDING MEDIA		WEAR - CHEMICAL - BALLISTIC RESISTANCES	FOUDNRY		KILN CONSTRUCTION
Fired parts	MATERIALS	Alumina	Vitrified bounded abrasives	Alumina Zirconium oxide	Alumina Zirconium oxide	Mullite	Clay-bonded SiC	Mullite
	TYPICAL PARTS	Catalyst carriers & membranes	Wheels	Balls	Seals, nozzles, pistons, armours,...	Molten metal filters		Tubes & Rollers
	MAXIMUM TEMPERATURE (°C)	1400	1300	1650	1650	1250	1450	1600
Our kiln furniture solutions	BATTS	Aptasinit SC 100 RG* Aptakor 99*	Aptakarb 70*	-	Aptakor 80 Aptakor 85 Aptakor 99 SC 100 RG* Aptazirox C4	Cormull C1E Aptakorit CM1 Aptakorit LS Aptakarb 70	Aptasinit	-
	BOX & RING-SAGGARS	Aptasinit* SC 100 RG*	-	Aptakor 80 Aptakor 85 Aptamull HT SC 100 RG		-	-	-
	PUSHER BATTS	-	-	Aptakor 85	Aptakor 85	Aptakorit CM1	-	-
	BEAMS	-	Aptasinit SC 90 S	-	SC 100 RG	SC 90S Aptasinit	-	SC 100 RG
	PROPS - LEGS - PINS - SPACERS	Aptakor 80 Aptakor 85 Aptakor 99	Cormull C1E Aptakorit CME Aptakorit CM1	-	Aptakor 85 Aptamull HT SC 100 RG	Cormull C1E Aptakorit CME Aptakorit CM1	Aptakor 85	-
	PIN-RODS	-	-	-	-	-	-	SC 100 RG

* : alumina coated

APPLICATIONS		POWDERS CALCINATION				ELECTRONICS		
Fired parts	MATERIALS	Li-Ion	Pigments	Electronics	Luminescence	Various oxides	Various materials	X - Zinc
	TYPICAL PARTS	-	-	-	-	MLCC	Piezo	Soft ferrites
	MAXIMUM TEMPERATURE (°C)	1200	1300	1400	1300	1400	1400	1450
Our kiln furniture solutions	SETTERS	-	-	-	-	Aptakor 99G	Aptazirox CF	Aptakor 80 Aptakor 85 Aptamull HT
	BOX & RING-SAGGARS	Aptakor 99 G8 F3 F3XX	Aptakorit CM1 Aptakorit LS Aptakor 80 Aptakor 85 SC 100 SG	Aptakor 99 Aptazirox C4	Aptakor 99G	-	-	
	PUSHER BATTS	-	-	-	-	Aptakor 80 - Aptakor 85		
	PROPS - LEGS - PINS - SPACERS	-	-	-	-	Aptakor 85S		Aptakor 80 Aptakor 85
	STRUCTURE	-	-	-	-	Butterfly RSiC mullite coated		-

Multi Layers Ceramic Capacitors (MLCC) fired at 1280°C



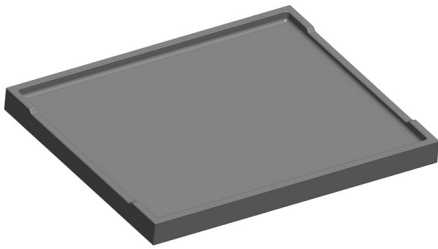
Problem

Avoid bending of the current "spaghetti"-rack systems (mullite) with quite complicated manipulation.

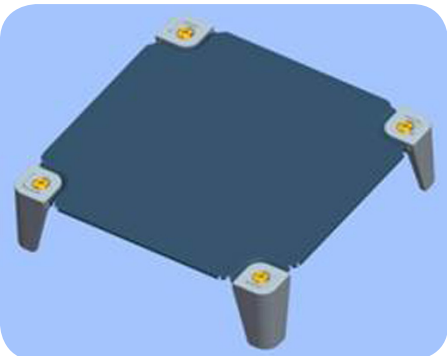
Solution

Ultra-light RSiC-"Butterfly" rack system (Al_2O_3 engobed)

- assures stable flatness over service life with connector elements (Aptamull 84)
- allows easy handling of stackable system
- MLCC components placed onto Al_2O_3 or ZrO_2 setters



Diesel particle filters (DPF) honeycombs firing at 1450°C



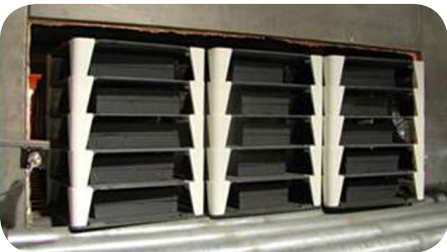
Problem

Avoid DPF to loose geometric precision.

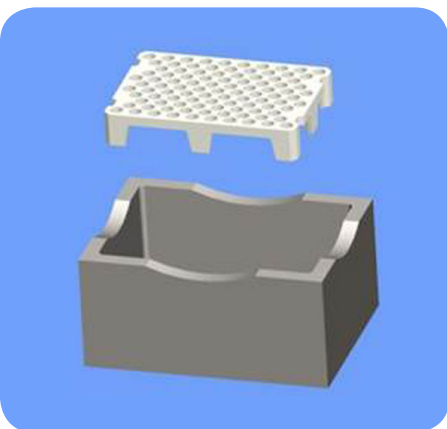
Solution

Combination of NSiC-batt with Aptamull 84 feet (LPIM):

- NSiC batts warrants flatness
- attached feet allows reduced costs



Spark-plugs fired at 1650°C



Problem

Avoid spark-plugs to bend or loose geometric precision during firing.

Solution

Use of mullite insert made with Aptamul 84 (LPIM):

- very precise hole dimensions to maintain vertical the spark-plugs during firing
- fitted insert dimensions for existing box-saggars
- perfect for automatic handling related to loading and unloading of the spark-plugs

OUR SOLUTIONS

PRODUCT NAME			Cormull C1E	Aptakorit CM1	Aptakorit LS	Aptakorit CME	Aptakor 80	Aptakor 85	Aptakor 85S	Aptamull HT	Aptakor 99	Aptakor 99G
MATERIAL GROUP			Cordierite / Mullite				Mullite / Alumina				Alumina	
MAX. SERVICE TEMPERATURE (OXYDING) °C			1300	1350	1380	1350	1500	1700	1500	1700	1700	1700
THERMAL SHOCK RESISTANCE			++	+++	+++	++	++	++	++	++	-	-
CREEP RESISTANCE			+++	+++	+++	++	++	++	+	+++	++	++
CHEMICAL RESISTANCE			-	-	-	-	++	++	-	++	+++	+++
SHAPING PROCESS			Extrusion	Pressing	Casting	Extrusion	Pressing	Pressing	Injection	Pressing	Extrusion	Pressing
APPARENT DENSITY		g.cm ⁻³	2.05	2.04	1.84	2.05	2.70	2.70	2.30	2.51	3.20	3.87
APPARENT POROSITY		%	22.0	22.0	30.0	22.0	20.0	17.0	29.0	23.0	18.0	0.0
MOR 3- points	at 20°C	MPa	19.0	13.5	13.0	19.0	11.0	8.0	34.0	9.0	8.0	318.0
	at 1300°C		-	-	10.0	-	13.0	7.0	-	8.5	13.0	-
THERMAL EXPANSION COEFFICIENT (1000°C)		x10-6 K ⁻¹	2.8	2.1	1.8	2.3	5.6	5.2	5.5	5.0	8.0	8.1
HIGH TEMPERATURE CREEP		mm	-	-	-	-	-	0.59	-	0.29	0.70	-
CONDITIONS			-	-	-	-	-	(2)	-	(2)	(2)	-
THERMAL CONDUCTIVITY	at 20°C	W / m K	1	1	1	1	-	-	-	-	-	-
SPECIFIC HEAT COEFFICIENT	at 20°C	J / kg K		900	900	900	-	-	-	-	-	-
CHEMICAL COMPOSITION	Al ₂ O ₃	%	38.0	38.0	41.0	40.0	84.0	83.0	86.0	82.0	99.5	99.7
	SiO ₂		50.0	50.0	48.0	48.0	15.0	16.0	14.0	17.0	-	traces
	MgO		7.0	7.0	8.0	7.7	-	-	-	-	-	-
PHASE CONTENT	Alumina	%	-	-	-	-	-	55.0	-	25.0	99.0	-
	Mullite		-	-	-	-	-	40.0	-	75.0	-	-

(1) : measured at 1250°C (1250°C/4h/10MPa)

(2) : measured at 1700°C (1700°C/10h/no load)

PRODUCT NAME			Aptazirow CF	Aptazirow C4	Aptakarb 70	SC 90 S	Aptasinit	SC 100 RG	G8	F3	F3XX
MATERIAL GROUP			ZrO2		SiC clay-bonded	Si-SiC	N-SiC	R-SiC	Cordierite/Spinel		
MAX. SERVICE TEMPERATURE (OXYDING) °C			1400	1400	1400	1350	1550	1550	1200	1200	1200
THERMAL SHOCK RESISTANCE			-	-	++	++	++	+++	++	+	++
CREEP RESISTANCE			-	-	++	+++	+++	+++	-	-	-
CHEMICAL RESISTANCE			+++	+++	+	++	+	+	++	+	++
SHAPING PROCESS			Pressing	Pressing	Pressing	Extrusion	Casting	Casting	Pressing	Pressing	Pressing
APPARENT DENSITY		g.cm ⁻³	4.10	4.00	2.60	3.00	2.85	2.70	2.50	2.40	-
APPARENT POROSITY		%	26.8	28.5	18.0	< 1,0	7.2	16.0	25.5	27	-
MOR 3- points	at 20°C	MPa	39.6	8.0	17.0	200.0	190.0	95.0	13.0	13.0	-
	at 1300°C		-	2.5	-	275.0	170.0	110.0	-	-	-
MODULUS OF ELASTICITY		GPa	-	-	-	350	220	260	-	-	-
THERMAL EXPANSION COEFFICIENT (1000 °C)		x10 ⁻⁶ K ⁻¹	8.8	7.5	4.9	4.0	4.5	4.8	5.30	4.14	-
HIGH TEMPERATURE CREEP		mm	-	-	-	0.00	0.00	0.00	-	-	-
CONDITIONS			-	-	-	(1)	(1)	(1)	-	-	-
THERMAL CONDUCTIVITY	at 20°C	W / m K	-	-	-	100	45	35	-	-	-
	at 1200°C		-	-	-	24	12	27	-	-	-
SPECIFIC HEAT COEFFICIENT	at 20°C	J / kg K	-	-	-	600	980	-	-	-	-
	at 1200°C		-	-	-	1200	1100	-	-	-	-
CHEMICAL COMPOSITION	Al ₂ O ₃	%	-	-	-	-	-	-	78.5	68.9	-
	SiO ₂		-	-	-	-	-	-	12.5	22.8	-
	MgO		-	-	-	-	-	-	8.0	6.8	-
	ZrO ₂		95.0	95.0	-	-	-	-	-	-	-
PHASE CONTENT	Alumina	%	-	-	-	-	-	-	41.0	-	33.5
	Mullite		-	-	-	-	-	-	21.0	-	17.5
	Cordierite		-	-	-	-	-	-	12.0	-	26.0
	Spinel		-	-	-	-	-	-	25.0	-	15.0
	SiC		-	-	70.0	82.0	68.0	> 99,0	-	-	-
	Si ₃ N ₄		-	-	-	-	27.0	-	-	-	-
	Oxides		-	-	-	-	5.0	-	-	-	-
	free Si		-	-	-	18.0	-	-	-	-	-

(1) : measured at 1250°C (1250°C/4h/10MPa)

(2) : measured at 1700°C (1700°C/10h/no load)

