

SILICONISED GRAPHITE

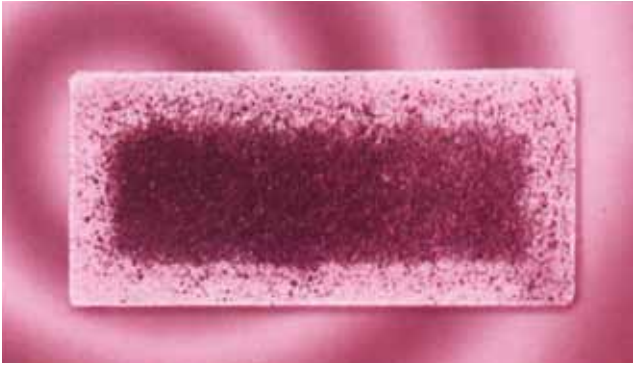
For mechanical applications



ISO 9001:2000 | ISO 14001

APPLICATIONS

Silicon carbide converted graphite has a wide range of applications, especially in areas with high friction or dry friction components or in working in very hard conditions:



- Seal rings for mechanical seals
- Mating rings in mechanical seals
- High speed sealing
- Heavy duty bearings
- Valve seats for high temperature or with corrosive fluid

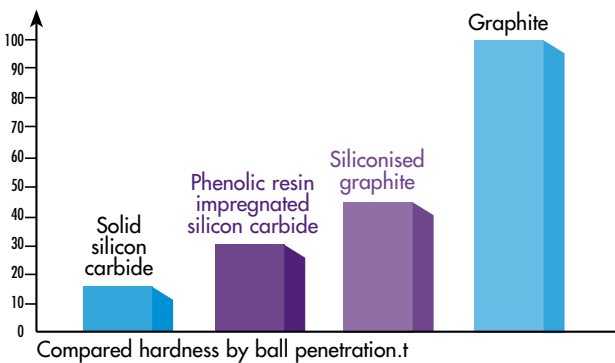
THE MAIN POINTS OF SILICONISED GRAPHITE

Hardness

Surface hardness is close to that of solid silicon carbide. In the Mohs scale of hardness it is just between aluminium oxide and diamond.

Microhardness measurements give the following minimum values:

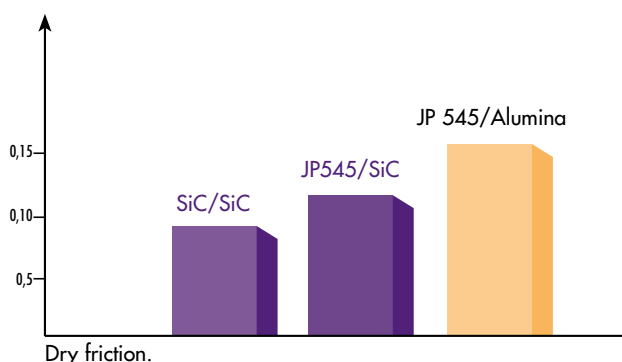
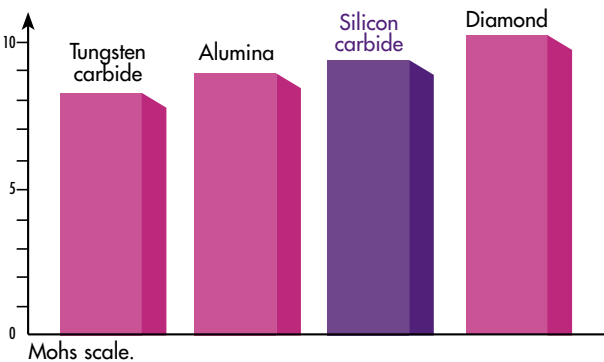
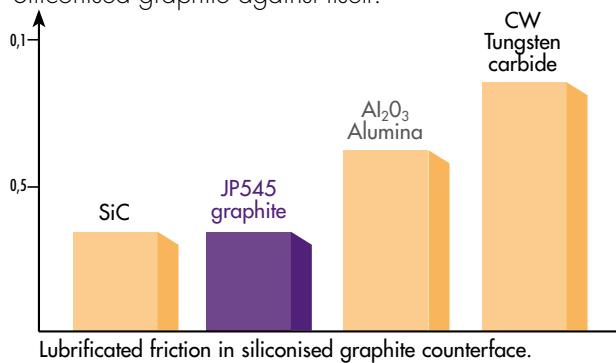
- Vickers : > 2 500
- Rockwell B : ≥ 100



Self lubrication capability

The converted part of the piece contains a small percentage of non converted graphite. This lubricates the contact area and gives a lower friction rate. We have measured this rate and classified different materials combinations. The best performances were achieved with:

- Resin impregnated hard carbon JP 545, against siliconised graphite mating ring.
- Siliconised graphite against itself.



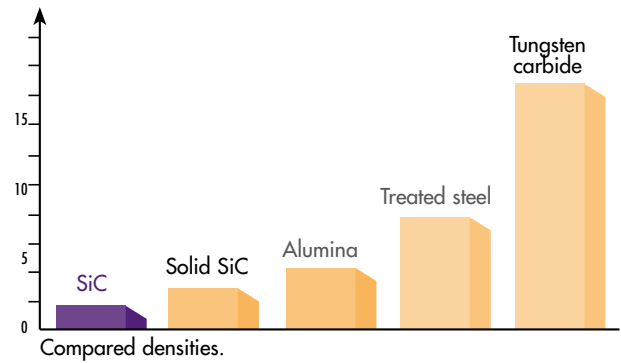
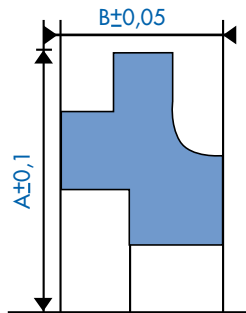
MECHANICAL APPLICATIONS

+ Weight

Its density is 1.9 to 2.0. It is less than steel (7.8), ceramics, and far less than tungsten carbide.

+ Possibility to supply complex shapes

Because of their hardness, it is difficult to machine ceramics or metal carbide items, diamond tooling being required. CARBONE LORRAINE has developed a conversion process which is carried out after machining. We are able to supply within 1 mm tolerances (0.004 inch) without the need of finishing operations. For tighter tolerances grinding and lapping is necessary. Seal rings can be supplied with a 2 helium light band flatness. Our shops are fully equipped with the latest machine tools and we are able to offer items with complex shapes from small to large series at competitive prices.



+ Abrasion resistance

Because of its very high surface hardness, it is able to operate successfully even against the most abrasive counterfaces. It is also capable of working with fluids containing abrasive particles.

+ Chemical inertness

Both silicon carbide and graphite are unaffected by most of corrosive liquids and gases: acids, bases, solvents... A compatibility chart is available on request.

+ Temperature and thermal shock resistance

Silicon carbide and graphite are two refractory materials. In neutral or reducing atmospheres the maximum operating temperature is over 1,000°C (1,850°F). In an oxydising atmosphere, it is 450°C (840°F). However over this temperature the rate of oxidation is 10 times less than that of normal fine grain graphite without silicon carbide conversion. The converted outer part protecting the inner graphite. Note, for JPS 145 when imperviousness is obtained with resin impregnation the maximum temperature is 250°C (480°F).

+ Thermal conductivity

It is a little less than that of graphites: $46 \text{ W} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$ (2 M BTU/ft.hr.°F). However it is enough to conduct the heat generated from the friction zone.



PHYSICAL PROPERTIES OF SILICONISED GRAPHITE

	JPS 100 Standard	JPS 145 impervious
Apparent density	1.90	1.90
Porosity	10 %	impervious at 6 bars
Breaking strength	<ul style="list-style-type: none"> flexion 45 MPa compression 140 MPa 	<ul style="list-style-type: none"> 70 MPa 150 MPa
Surface hardness	<ul style="list-style-type: none"> Rockwell B ≥ 100 Vickers 2 500 	<ul style="list-style-type: none"> ≥ 100 2 500
Coefficient of expansion between 20 et 200°C	$4.0 \mu\text{m} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$	$4.0 \mu\text{m} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$
Thermal conductivity 20°C	$46 \text{ W} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$	$46 \text{ W} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$
Temperature resistance	<ul style="list-style-type: none"> oxydising atmosphere 450°C reducing atmosphere 1 800°C 	<ul style="list-style-type: none"> 250°C 250°C

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CUSTOMER-ORIENTED INTERNATIONAL NETWORK



PARTNER IN INNOVATION

Carbone Lorraine harnesses prime expertise in industrial applications to deliver innovative solutions – involving graphite, other high-performance materials, and key components for electric motors and electronic equipment – for many high-technology markets.

As world number-one in its main business specialities, Carbone Lorraine fields an extensive industrial and commercial network covering around 40 countries, working hand in hand with its clients to pursue permanent innovation through a broad range of top-class products and services.



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