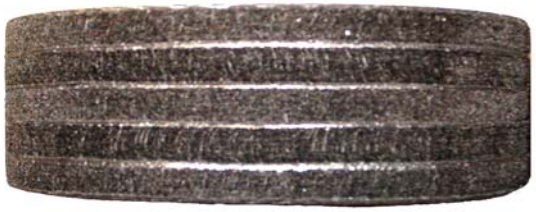
CARBON COMPOSITES INC.

"Innovations in Carbon"

Composite Sandwich Board Insulation

CSB has been engineered to provide maximum longevity to CVD and Sintering Furnaces. Multiple layers of graphite foil sandwiched between semi-rigidized felt layers create an effective barrier to process gas infiltration and convection. CSB is suitable in most high temperature applications operating up to 2,800°C (5,072°F) in an inert or vacuum environment.



CONSTRUCTION: CSB is produced by laminating multiple layers of semi-rigidized felt and graphite foil between 0.025" thick sheets of Carbon/Carbon Composite (C/C). Optionally, graphite foil may be bonded to one or both faces.

STANDARD SIZES: In addition to these standard sizes, boards can be manufactured to customer specification, eliminating the need for most joints. Panels are available in sizes up to 90" long x 55" wide x 8" thick (2290 x 1400 x 200mm).

Length	Width	Thickness	Thickness Tolerance
1000mm	1500mm	20, 30, 40, 50	± 2mm
1000mm	1000mm	20, 30, 40, 50	± 2mm
24"	42"	1", 1.5", 2"	± 0.08"
24"	48"	1", 1.5", 2"	± 0.08"
24"	52"	1", 1.5", 2"	± 0.08"
48"	60"	1", 1.5", 2"	± 0.08"

MATERIAL ATTRIBUTES:

- Multiple Foil Layers: Act as a diffusion barrier to process gas infiltration that can attack rigidized felt.
- Erosion Resistance: C/C exterior provides a robust barrier; protecting the insulating core from damage by dropped parts, melt splatter, or high velocity particle abrasion.
- Dimensional Stability: Solid C/C composite construction will not bow, warp, or crack as a result of thermal shock or cycling.
- Machinability: CSB is readily machinable using conventional methods such as cutting, drilling, sawing, and milling.
- Low Specific Heat: Allows for rapid furnace cycling and improved throughput.
- Purity: Halogen and Vacuum purification available for Semiconductor related applications.

Typical Properties	SI Units		English Units	
Density (see note)	.20	g/cm³	12.5	lb/ft³
Thermal Conductivity (Argon) 1,000°C (1,832°F) (⊥) 2,000°C (3,632°F) (⊥)	 0.47 0.88	 W/mK W/mK	 3.26 6.11	 BTU in/hr ft² BTU in/hr ft²
Thermal Conductivity (Vacuum) 1,000°C (1,832°F) (⊥) 2,000°C (3,632°F) (⊥)	 0.33 0.67	 W/mK W/mK	 2.29 4.65	 BTU in/hr ft² BTU in/hr ft²
CTE: 20 – 1,000°C (//) (68 – 1,832°F) (//)	2.5 x 10^{-6}	1/K	1.4 x 10^{-6}	1/°F
Flexural Strength (⊥)	2.0	MPa	300	psi
Compressive Strength (⊥) @ 10% Deformation	0.276	MPa	40	psi

Note: C/C shell not included in measured density.

Material Grade	Total Ash	Sulfur Content	Total Elemental Impurities	Processing Temp
CSB-230	≤ 0.1%	300 ppm	500 - 1,000 ppm	1,900°C
CSB-230H	≤ 0.01%	25 ppm	≤ 150 ppm	1,900°C
CSB-230HP	N/A	5 ppm	≤ 20 ppm	2,100°C w/ Halogen

12 Jytek Park, Leominster, MA 01453, USA www.CarbonCompositesInc.com Phone: 1-978-840-0707