

## General information

### Designation

C: pure, graphite

### Typical uses

Brushes; electrodes; jigs; casting molds; thermal insulation; bearings; rocket nozzles; composites; refractory bricks; nuclear seals;

## Composition overview

### Compositional summary

100% C

Material family	Ceramic (technical)
Base material	C (Carbon)

### Composition detail (metals, ceramics and glasses)

C (carbon)	100	%
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### Price

Price	* 5.08	-	7.71	USD/lb
Price per unit volume	* 697	-	1.09e3	USD/ft^3

### Physical properties

Density	0.0795	-	0.0816	lb/in^3
Porosity (closed)	0			%
Porosity (open)	0			%

### Mechanical properties

Young's modulus	1.45	-	3.63	10^6 psi
Yield strength (elastic limit)	* 1.45	-	16	ksi
Tensile strength	1.45	-	16	ksi
Elongation	* 0.04	-	1.1	% strain
Compressive strength	* 6.24	-	50.8	ksi
Flexural modulus	* 1.45	-	3.63	10^6 psi
Flexural strength (modulus of rupture)	* 0.754	-	6.09	ksi
Shear modulus	* 0.435	-	1.31	10^6 psi
Bulk modulus	4.35	-	5.22	10^6 psi
Poisson's ratio	0.22	-	0.3	
Shape factor	14.2			
Hardness - Vickers	4	-	50	HV
Fatigue strength at 10^7 cycles	* 3.9	-	4.55	ksi
Mechanical loss coefficient (tan delta)	* 8e-4	-	0.004	

### Impact & fracture properties

Fracture toughness	0.819	-	1	ksi.in <sup>0.5</sup>
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### Thermal properties

Melting point	6.61e3	-	6.92e3	°F
Maximum service temperature	2.37e3	-	3.09e3	°F
Minimum service temperature	-459			°F
Thermal conductivity	46.2	-	139	BTU.ft/hr.ft <sup>2</sup> .°F
Specific heat capacity	0.167	-	0.172	BTU/lb.°F
Thermal expansion coefficient	0.333	-	2.39	µstrain/°F
Latent heat of fusion	* 692	-	778	BTU/lb

### Electrical properties

Electrical resistivity	13.7	-	2.37e3	µohm.in
Galvanic potential	0.2	-	0.28	V

### Magnetic properties

Magnetic type	Non-magnetic
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### Optical properties

Color	Black
Transparency	Opaque

### Critical materials risk

Contains >5wt% critical elements?	No
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### Durability

Water (fresh)	Excellent
Water (salt)	Excellent
Weak acids	Excellent
Strong acids	Acceptable
Weak alkalis	Excellent
Strong alkalis	Unacceptable
Organic solvents	Excellent
Oxidation at 500C	Limited use
UV radiation (sunlight)	Excellent
Halogens	Acceptable
Metals	Acceptable
Flammability	Non-flammable

### Primary production energy, CO2 and water

Embodied energy, primary production	8.99e4	-	9.89e4	BTU/lb
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**Sources**

198 MJ/kg (Jungbluth, 2008); 240 MJ/kg (Jungbluth, 2008)

CO2 footprint, primary production

15.8 - 17.4 lb/lb

**Sources**

14.8 kg/kg (Jungbluth, 2008); 18.3 kg/kg (Jungbluth, 2008)

Water usage

\* 8.05e3 - 8.91e3 in^3/lb

**Processing energy, CO2 footprint & water**

Grinding energy (per unit wt removed)

\* 4.7e3 - 5.19e3 BTU/lb

Grinding CO2 (per unit wt removed)

\* 0.82 - 0.906 lb/lb

**Recycling and end of life**

Recycle

✗

Recycle fraction in current supply

4.73 - 5.22 %

Downcycle

✓

Combust for energy recovery

✓

Heat of combustion (net)

\* 1.37e4 - 1.44e4 BTU/lb

Combustion CO2

\* 3.58 - 3.76 lb/lb

Landfill

✓

Biodegrade

✗

**Notes**
**Other notes**

Price depends very strongly on form - lump, chip and flake graphite is 4-5x the price of amorphous graphite. Graphite has excellent thermal shock resistance and good abrasion resistance.

**Links**

ProcessUniverse

Producers

Reference

Shape