

Carbon=Carbon Composites

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Carbon-Carbon Composites

- What are carbon-carbon composites?

Carbon - Carbon composites have carbon fibers in carbon matrix.

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Advantages of Carbon-Carbon Composites

- Gradual failure
- Withstand high temperatures
- Low creep at high temperatures
- Low density
- High thermal conductivity
- Low and tailorable coefficient of thermal expansion

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Advantages of Carbon-Carbon Composites

- Great strength to weight ratio
- High modulus, thermal conductivity, and electrical conductivity
- Good thermal shock resistance, abrasion resistance, and fracture toughness
- Excellent high temperature durability in inert or vacuum environment
- Good corrosion resistance

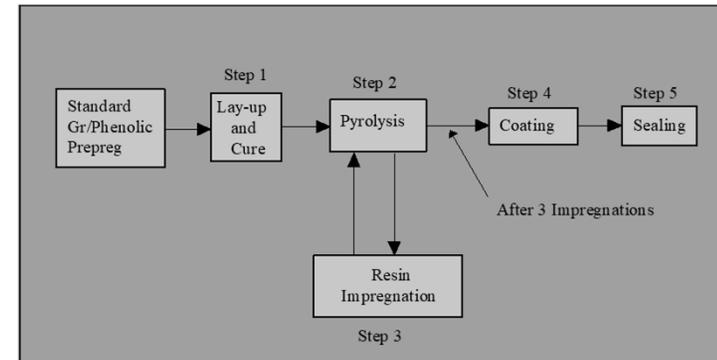
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Table 1.14 Typical mechanical properties of carbon-carbon matrix composites

Property	Units	C-C	Steel	Aluminum
Specific Gravity		1.68	7.8	2.6
Young's modulus	Msi	1.95	30	10
Ultimate Tensile Strength	Ksi	5.180	94	34
Coefficient of Thermal Expansion	$\mu\text{in/in}/^\circ\text{F}$	1.11	6.5	12.8

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Carbon-Carbon Manufacturing



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Applications of C-C Composites

- Space Shuttle Nose Cones
 - Re-entry temperature of 3092 K
- Aircraft Brakes
 - Saves 450 kgs of mass
 - 2-4 times durability vs. steel
 - 2.5 times specific heat of steel

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