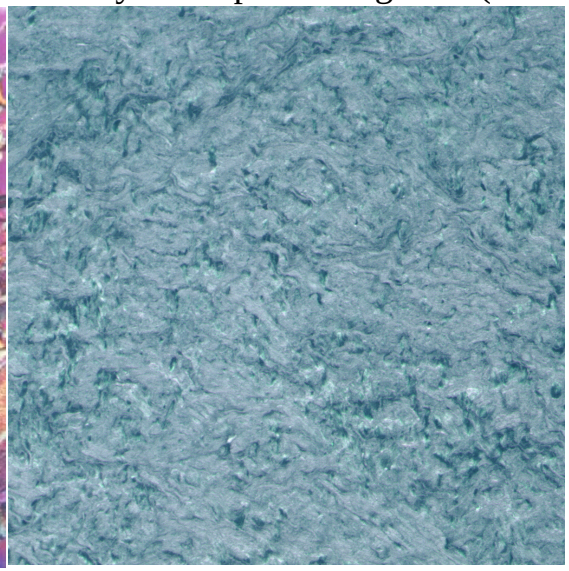
Carbon-Carbon Thermal Management

By utilizing a low-cost slurry molding process has been developed for producing high density preforms and further densification with pitch melt impregnation, a low cost method for producing high thermal conductivity carbon-carbon for thermal management applications has been developed. These preforms reduce the required densification time and, therefore, decrease costs. The resulting composites have higher transversely isotropic strengths and out-of-plane thermal conductivities at a fraction of the cost than traditional carbon-carbon composites. Applications ranging from thermal radiators for satellites to circuit board substrates require thermal conductivities higher than traditional low-cost techniques can produce.

Future research is aimed at producing parts for use in other non-traditional carbon-carbon arenas, such as carbon-carbon pistons. Furthermore, the low thermal expansion makes this material ideal for applications where high heat dissipation and dimensional stability (i.e. low thermal expansion) are required, such as mirrors for satellite imaging (i.e. hubbell, weather). Current composite densities of 1.5 g/cm^3 are achieved without any densification process and densities as high as 1.74 g/cm^3 are achievable in as little as 8 days total processing time (6 months for conventional CVI).



Carbon-Carbon Materials

Density	1.74 g/cm^3
Flexural Strength	> 130 MPa
Thermal Conductivity	
in-plane	up to 205 W/m·K
out-of-plane	up to 44 W/m·K

Potential Applications:

Thermal substrates, heat shields, frictional materials, ablative materials

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Contact: James Klett
423-574-5220
klettjw@ornl.gov

www.ms.ornl.gov/cimtech/cimtech.html