

Simplifying the Thermal Conductivity and Thermal Expansion Characterization of Carbon Composites

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Accurate measurement of the thermophysical properties of new, exotic carbon composites is critical in their design process. Researchers are targeting a carbon-based material with a rising thermal conductivity when subjected to increasing temperatures, with an extremely low thermal expansion coefficient through this temperature range. Through the initial Research & Development stage, fast and accurate measurement of these parameters helps to delineate different approaches to achieving the desired materials mechanical and thermal properties. The use of the modified transient plane source (MTPS) method provides for a powerful and quick way to determine the thermal conductivity in complex carbon composite materials. Thermal expansion is measured with a high-resolution interferometer. The accuracy of both methods is verified in testing certified reference materials. Ranking of a variety of carbon composite samples through a range of temperatures is presented. Thermal conductivity is measured over a temperature range of 25 to 200°C, and thermal expansion from room temperature to 1000°C.