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Influence of Cryogenic Thermal Cycling Treatment on the Thermophysical Properties of Carbon/Carbon Composites between Room Temperature and 1900 °C

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Influence of cryogenic thermal cycling treatment (from -120 °C to 120 °C at 1.3×10^{-3} Pa) on the thermophysical properties including thermal conductivity (TC), thermal diffusivity (TD), specific heat (SH) and coefficient of thermal expansion (CTE) ranging from room temperature to 1900 °C of carbon/carbon (C/C) composites in *x*-*y* and *z* directions were studied. Test results showed that fiber/matrix interfacial debonding, fiber pull-out and microcracks occurred after the cryogenic thermal treatment and they increased significantly with the cycle number increasing, while cycled more than 30 times, the space of microdefects reduced obviously due to the accumulation of cyclic thermal stress. TC, TD, SH and CTE of the cryogenic thermal cycling treated C/C composites were first decreased and then increased in both directions (*x*-*y* and *z* directions) with the increase of thermal cycles. A model regarding the heat conduction in cryogenic thermal cycling treated C/C composites was proposed.