CONSTITUENT DEVELOPMENT FOR HIGHER-TEMPERATURE CAPABLE CERAMIC MATRIX COMPOSITES

Michael K. Cinibulk, Air Force Research Laboratory, WPAFB OH
michael.cinibulk@us.af.mil

Key Words: CMCs, fibers, interphase, matrix, coatings

Two of the highest capability priorities for the Air Force, energy-efficient turbine engines and long-range precision strike require high-temperature CMCs to enable increased turbine engine efficiency and thermal protection of hypersonic vehicles. Ceramic-matrix composites (CMCs) currently lack the temperature capability and durability required for long-life at the highest temperatures desired.

This presentation highlights research that is addressing the need for improved high-temperature-capable CMCs, with a focus on CMC constituents and an understanding of their processing, microstructure, and behavior in relevant service environments. The most pervasive lifetime and temperature limitations for SiC/SiC CMCs are related to oxidation, creep and stress rupture of the fibers, oxidation-induced instability of the fiber-matrix interface, and instability of the matrix at temperatures >1400°C. Consequently, we are addressing these shortcomings by developing technologies to enable higher-temperature capable SiC fibers, oxidation-resistant fiber-matrix interfaces, and improvements in processing of refractory matrices for both turbine engine and hypersonic applications.