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ACTIVE OXIDATION OF A UHTC-BASED CMC

Abstract

The active oxidation of ceramic matrix composites (CMC) is a severe problem that must be avoided for multi-use vehicles. Much work has been done on the active oxidation of silicon-based CMCs such as C/SiC and SiC-coated carbon/carbon (C/C). Ultra high temperature ceramics (UTHC) and UHTC-based CMCs have been proposed as possible material solutions for high-temperature applications. However, little work has been performed on the active oxidation of UHTC-based materials. The intent of this paper is to present test data indicating an active oxidation process for a UHTC-based CMC similar to the active oxidation observed with Si-based CMCs. A UHTC-based CMC was tested in the HyMETS plasma wind tunnel (PWT) (arc-jet) at NASA Langley Research Center, Hampton, VA. The coupon was tested at a nominal surface temperature of 3000F and 0.026 atm stagnation pressure. A rapid and large increase in surface temperature was noticed with negligible increase in the heat flux, indicative of the onset of active oxidation. It is shown that the surface conditions, both temperature and pressure, fall within the region for passive to active transition (PAT) of the oxidation.