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ABSTRACT

Environmental barrier coating (EBC) coated ceramic matrix composite (CMC) systems are currently being investigated for use as turbine engine hot-section components in extreme environments. In these extreme conditions, it becomes critical to understand material response to environmental exposure and performance under thermo-mechanical loading. Electrical resistance (ER) monitoring has recently been correlated to tensile damage accumulation in SiC/SiC CMCs, and the focus of this study is to extend the use of ER to evaluate high-temperature thermal gradient fracture of EBC/CMC systems. Tensile strength tests were performed at high temperature (1200°C) using a laser-based heat-flux technique. Specimens included an as-produced SiC/SiC CMC and coated SiC/SiC substrate that have been exposed to simulated combustion environments in a high-pressure burner rig. Localized stress-dependent damage was determined using acoustic emission (AE) monitoring and compared to full-field strain mapping using a high-temperature digital image correlation (DIC) technique. The results are compared with in-situ ER monitoring, and post-test inspection of the samples in order to correlate ER response to damage evolution.