

CURRENT EBC DEVELOPMENT AND TESTING AT NASA

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SiC/SiC Ceramic Matrix Composites (CMCs) are a game changer for advanced power generation equipment because of their high temperature capability, oxidation resistance, and light weight that translate to significant reduction in fuel consumption and emission. Limitations of SiC/SiC CMCs include surface recession and component cracking and associated chemical and physical degradation in the CMC. The solution pursued to mitigate surface recession of SiC/SiC CMCs is the incorporation of coating systems that provide surface protection, which has become known as an Environmental Barrier Coating (EBC). The development of EBCs for the protection of SiC/SiC CMCs was a continuation of coating development work for corrosion protection of silicon-based monolithics. The first and second generation EBCs developed in mid 1990s-early 2000s laid the foundation for current EBCs. Environmental degradation that limits EBC life includes surface recession by steam, oxidation in steam environments, and CMAS-EBC reactions. Many engine tests have been conducted since late 1990s and a first CMC component entered into service in 2016 in a commercial engine. The introduction of CMCs represents significant challenges as failure of the EBC means rapid reduction in component life. A reliable lifing method and engine-relevant testing methods to validate life need to be developed. This paper will current activities on EBC development and testing at NASA.