

Special Issue Reprint

Environmental Barrier Coatings

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The global increase in air travel will require commercial vehicles to be more efficient than ever before. Advanced engine hot section materials are a key technology required to keep fuel consumption and emission to a minimum in next-generation gas turbines. Ceramic matrix composites (CMCs) are the most promising material to revolutionize gas turbine hot section materials technology because of their excellent high-temperature properties. Rapid surface recession due to volatilization by water vapor is the Achilles heel of CMCs. Environmental barrier coatings (EBCs) is an enabling technology for CMCs, since it protects CMCs from water vapor. The first CMC component entered into service in 2016 in a commercial engine, and more CMC components are scheduled to follow within the next few years. One of the most difficult challenges to CMC components is EBC durability, because failure of EBC leads to a rapid reduction in CMC component life. Key contributors to EBC failure include recession, oxidation, degradation by calcium-aluminum-magnesium silicates (CMAS) deposits, thermal and thermo-mechanical strains, particle erosion, and foreign object damage (FOD). Novel EBC chemistries, creative EBC designs, and robust processes are required to meet EBC durability challenges. Engine-relevant testing, characterization, and lifing methods need to be developed to improve EBC reliability. The aim of this Special Issue is to present recent advances in EBC technology to address these issues. In particular, topics of interest include but are not limited to the following: • Novel EBC chemistries and designs; • Processing including plasma spray, suspension plasma spray, solution precursor plasma spray, slurry process, PS-PVD, EB-PVD, and CVD; • Testing, characterization, and modeling; • Lifing.

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