Bond Coat Layers for Multilayer Thermal / Environmental Barrier Coatings

Jeffrey W. Fergus, Honglong Wang, Emily Tarwater
Auburn University
Kyle Murphree
Plasma Processes, Ltd.

Introduction
Extend Life Gas Turbine Materials
• Improved bond coat
• Stability in Ca-Mg-Al-Si-O (CMAS)

Coating System
• Re diffusion layer
• Ir / Hf bond coat
• YSZ / pyrochlore TBC/EBC

EBC Materials
• Pyrochlore zirconates with improved stability in CMAS

Coating System

TBC: YSZ and/or pyrochlore

Hf (25-50 μm)
Ir (50-100 μm)
Re diffusion layer
Flash Ni coating
Alloy: 738LC

Metal Coatings (Re, Ir, Hf)
• Electrodeposition in molten salt – EL-Form™
• Inert atmosphere: Oxygen-sensitive refractory materials

Ceramic Coatings
• Very low pressure plasma spray
• Columnar microstructure

EBC Materials

Pyrochlore Zirconates vs YSZ
• Lower thermal conductivity
• Improved CMAS resistance

Promising Pyrochlores
• Gd2Zr2O7, Sm2Zr2O7
• Mixed lanthanides / doping

For references see J.W. Fergus, Metall. Mater. Trans. E, in press

Synthesis
• Sol-gel for phase formation
• High temperature for densification

Evaluation
• CMAS exposure
• Accelerated tests / phase stability at high temperatures