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Abstract

Functionally Graded Thermal barrier coating (FG-TBC) based on $LaTi_2Al_9O_{19}$ was prepared via air plasma spray and textured using pico-second Nd:YAG laser (wavelength 532nm, 3W) over the coating surface to resist the delamination or failure stresses caused by thermal mismatch when exposed to high temperature. Different laser scan speeds, depth and width were set on each sample and the surface structure was investigated by thermal shock test. The microstructure and surface morphology were analyzed by SEM and 3D Profilometer. In the case of the laser-textured TBC, the re-melted coating layer was completely absent. It was found that the laser textured grooves with 375 μm spacing enhances the strain tolerance of TBC and provides excellent thermal durability and lifetime of more than 186 cycles. When top layer experience expansion and contraction under high temperature exposure, the grooves in the top layer of FG-TBC provide additional stress/strain relief gap and prevents the coating from failure.

Keywords: Thermal Barrier coating; functionally graded; laser texturing; thermal durability.