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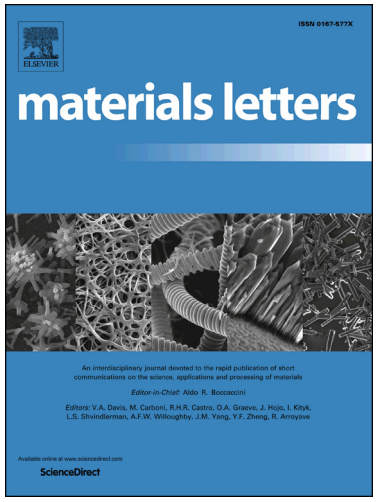

High temperature wettability between CMAS and YSZ coating with tailored surface microstructures

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High temperature wettability between CMAS and YSZ coating with tailored surface microstructures

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Abstract: In the present work, the wetting behaviors of molten calcium-magnesium-aluminum-silicate (CMAS) on femtosecond laser ablated YSZ coatings are comparatively studied. The results suggest that femtosecond laser ablated coating possesses smaller initial contact angle compared with as-sprayed or polished YSZ coatings, but lower spreading rate and larger equilibrium contact angle. This difference can be attributed to: 1) restricted CMAS spreading by the ablated squares through pinning the solid-liquid-vapor triple-phase contact line; 2) retarded CMAS penetration by microrod-shaped structure inside the ablated squares. This study provides an effective method to improve the CMAS resistance of YSZ coating by femtosecond laser.

Keywords: Thermal barrier coating; Corrosion; Wetting; Femtosecond laser; Ceramics; Contact angle

1. Introduction

Degradation of yttria stabilized zirconia (YSZ) based thermal barrier coatings (TBCs) due to infiltration of calcium-magnesium-aluminum-silicate (CMAS) becomes more dominant in the increased in-service temperature of current aero engines. The molten CMAS that rapidly infiltrated into the TBCs through pores or gaps solidifies after the cooling of the engine, leading to high stress in TBCs. In addition,

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