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Effect of spraying power on microstructure and property of nanostructured YSZ thermal barrier coatings

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Abstract:

Nanostructured yttria stabilized zirconia (n-YSZ) thermal barrier coatings were fabricated by atmospheric plasma spraying (APS) at different spraying powers. The microstructures, phase stability and mechanical properties of the n-YSZ coatings were examined by using scanning electron microscopy (SEM), X-ray diffraction (XRD) and Vickers indentation, respectively. The adhesion strength of coatings was evaluated according to ASTM C633-01 standard. Thermal cyclic oxidation method was carried out to study the effect of spraying power on thermal shock resistance of the coatings. Results showed that the n-YSZ coatings had a bimodal microstructure consisting of well melted splats and partially melted nanostructured areas. Both the porosity and the content of nanostructure in n-YSZ coatings decreased with increasing of the spraying power. After heat treatment at 1573 K, the porosity of the coating decreased and the hardness increased noticeably compared with that of the as-sprayed coating, indicating the sintering effect of the nanostructured coating. However, porosity of the coating deposited by the lowest spraying power (22 kW) still retain above 10% after annealing at 1573 K for 24 h,

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