

MECHANICAL AND THERMAL PROPERTIES OF NANOSTRUCTURED Gd₂O₃ DOPED YSZ COATINGS PREPARED BY ATMOSPHERIC PLASMA SPRAYING

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Four nanostructured Y₂O₃-ZrO₂(YSZ), 4mol%Gd₂O₃-YSZ(4Gd-YSZ), 6mol%Gd₂O₃-YSZ(6Gd-YSZ), 8mol%Gd₂O₃-Y₂O₃-ZrO₂(8Gd-YSZ) coatings were prepared by atmospheric plasma spraying (APS) technology under the same spraying parameters. The phase composition, microstructure, hardness, adhesion strength, thermal shock behavior and failure mechanism of nano-YSZ and GdYSZ were investigated systemically. The results showed that the as-sprayed GdYSZ coatings were consist of tetragonal ZrO₂ (t-ZrO₂) and Gd element was in solid solution with t-ZrO₂. The value of hardness, adhesion strength and thermal shock life for the as-sprayed nano-YSZ, 4Gd-YSZ, 6Gd-YSZ, 8Gd-YSZ coating were: YSZ > 4Gd-YSZ > 6Gd-YSZ > 8Gd-YSZ. Our investigations proved that the dopants Gd₂O₃ had the obvious effect on YSZ, that is Gd₂O₃ decreased the hardness, deteriorate the adhesion strength, and reduced thermal shock life. The more of Gd₂O₃ and the effect is obvious. Reasons of different properties for them were also analyzed in detail.