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Design of low-β MCrAlY coatings for potential gas turbine applications

Abstract
HVOF-MCrAlYs are considered potential replacement for high-performance but costly VPS/LPPS-MCrAlYs for gas turbine applications. In addition, HVOF-MCrAlY + SPS-YSZ TBCs are expected to be the next generation thermally-sprayed TBCs for industrial gas turbine applications, in which, the MCrAlY metallic bond coats need to be more durable and cost-effective. While a high aluminum-MCrAlY is more oxidation resistant, a smooth HVOF-MCrAlY/TGO interface is prone to crack propagation, leading to the premature coating failure. Reducing the β-NiAl phase amount in γ+β MCrAlYs may mitigate interfacial cracking between the HVOF-MCrAlY and TGO by decreasing the strain at the MCrAlY/TGO interface associated with the volume shrinkage of the MCrAlYs on cooling, which in turn may help to improve coating durability. This work studies the influence of alloying elements on the maximum β-NiAl phase amount in the MCrAlYs using Thermo-Calc, to envisage the possibility to develop high aluminum low-β MCrAlY coatings for potential gas turbine applications.

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