

Effect of Pack Aluminising Conditions on β NiAl Coatings

Authors : A. D. Chandio, P. Xiao

Abstract : In this study, nickel aluminide coatings were deposited onto CMSX-4 single crystal superalloy and pure Ni substrates by using in-situ chemical vapour deposition (CVD) technique. The microstructural evolutions and coating thickness (CT) were studied upon the variation of processing conditions i.e. time and temperature. The results demonstrated (under identical conditions) that coating formed on pure Ni contains no substrate entrapments and have lower CT in comparison to one deposited on the CMSX-4 counterpart. In addition, the interdiffusion zone (IDZ) of Ni substrate is a γ -Ni₃Al in comparison to the CMSX-4 alloy that is β -NiAl phase. The higher CT on CMSX-4 superalloy is attributed to presence of γ -Ni/ γ -Ni₃Al structure which contains ~ 15 at.% Al before deposition (that is already present in superalloy). Two main deposition parameters (time and temperature) of the coatings were also studied in addition to standard comparison of substrate effects. The coating formation time was found to exhibit profound effect on CT, whilst temperature was found to change coating activities. In addition, the CT showed linear trend from 800 to 1000 °C, thereafter reduction was observed. This was attributed to the change in coating activities.

Keywords : β NiAl, in-situ CVD, CT, CMSX-4, Ni, microstructure

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