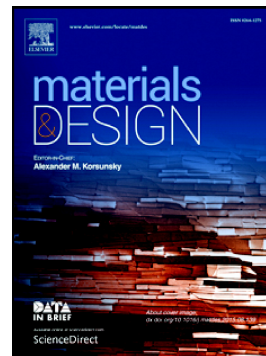


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Enhanced mechanical property with refined microstructure of a novel γ -TiAl/TiB₂ metal matrix composite (MMC) processed via hot isostatic press

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Abstract

The microstructure design strategy is introduced to improve the mechanical property of a novel γ -Ti-43.5Al-6.5Nb-1.5Cr-0.5C/TiB₂ metal matrix composite (MMC) fabricated by hot isostatic press (HIP). With increasing the content of TiB₂ from 0 to 3 wt%, the average grain size, {001} maximum texture index and average schmid factor of HIP-processed Ti-43.5Al-6.5Nb-1.5Cr-0.5C/TiB₂ parts generally decrease from 27.4 μ m, 7.9 and 0.43 to 22.7 μ m, 4.1 and 0.38, in addition, the crystallographic texture transforms from the mixture of (001) and (111) orientations to a strong (101) orientation. The phases evolution mechanism in the HIP-processed Ti-43.5Al-6.5Nb-1.5Cr-0.5C/TiB₂ parts can be divided into four steps: first of all, β phase transforms to γ and α phases, then, a small amount of new phases of TiB and TiC emerge by the diffusion of Ti and C atoms, subsequently, the β and α orderly transform to B₂ and α_2 , lastly, the B₂, α_2 , TiB₂, TiB and TiC uniformly distribute in the γ matrix. Both the tensile strength and strain of HIP-processed Ti-43.5Al-6.5Nb-1.5Cr-0.5C/TiB₂ components increase from 471.9 MPa and 1.7% to 653.4 MPa 2.1% with the increase of TiB₂ content from 0 to 3 wt%.

Keywords: Hot isostatic press, γ -TiAl/TiB₂ MMC, Mechanical properties, EBSD, HRTEM.

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