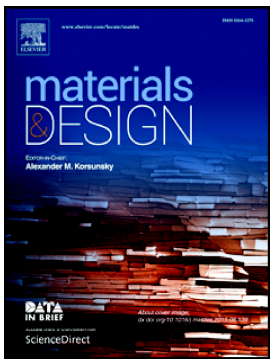

Enhanced mechanical property with refined microstructure of a novel γ-TiAl/TiB2 metal matrix composite (MMC) processed via hot isostatic press

Wei Li, Yi Yang, Ming Li, Jie Liu, Daosheng Cai, Qingsong Wei, Chunze Yan, Yusheng Shi

PII: S0264-1275(17)31130-9
DOI: https://doi.org/10.1016/j.matdes.2017.12.026
Reference: JMADE 3577

To appear in: *Materials & Design*

Received date: 23 October 2017
Revised date: 5 December 2017
Accepted date: 14 December 2017

Please cite this article as: Wei Li, Yi Yang, Ming Li, Jie Liu, Daosheng Cai, Qingsong Wei, Chunze Yan, Yusheng Shi , Enhanced mechanical property with refined microstructure of a novel γ-TiAl/TiB2 metal matrix composite (MMC) processed via hot isostatic press. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), https://doi.org/10.1016/j.matdes.2017.12.026

Enhanced mechanical property with refined microstructure of a novel γ-TiAl/TiB_2 metal matrix composite (MMC) processed via hot isostatic press

Wei Li, Yi Yang, Ming Li, Jie Liu, Daosheng Cai, Qingsong Wei*, Chunze Yan*, Yusheng Shi

State key Laboratory of Materials Processing and Die & Mould Technology, School of Materials Science and Engineering, Huazhong University of Science and Technology, Wuhan 430074, China.

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/TiB_2 metal matrix composite (MMC) fabricated by hot isostatic press (HIP). With increasing the content of TiB_2 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/TiB_2 parts generally decrease from 27.4 μm, 7.9 and 0.43 to 22.7 μm, 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/TiB_2 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 B_2 and α_2, lastly, the B_2, α_2, TiB_2, 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/TiB_2 components increase from 471.9 MPa and 1.7% to 653.4 MPa 2.1% with the increase of TiB_2 content from 0 to 3 wt%.

Keywords: Hot isostatic press, γ-TiAl/TiB_2 MMC, Mechanical properties, EBSD, HRTEM.

*Corresponding authors. Tel: +86(0)2787558155.

E-mail address: wqs_xn@hust.edu.cn (Q. Wei); c_yan@hust.edu.cn (C. Yan).