

## Accepted Manuscript

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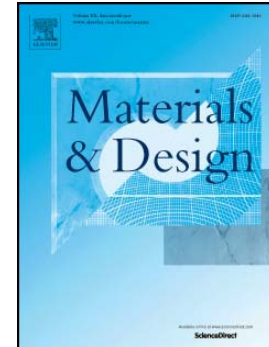
PII: S0264-1275(15)30427-5  
DOI: doi: [10.1016/j.matdes.2015.09.014](https://doi.org/10.1016/j.matdes.2015.09.014)  
Reference: JMADE 584

To appear in:

Received date: 18 June 2015  
Revised date: 3 September 2015  
Accepted date: 4 September 2015

Please cite this article as: Wencong Zhang, Mengmeng Wang, Wenzhen Chen, Yangju Feng, Yang Yu, Evolution of inhomogeneous reinforced structure in TiBw/Ti-6Al-4 V composite prepared by Pre-sintering and canned  $\beta$  extrusion, (2015), doi: [10.1016/j.matdes.2015.09.014](https://doi.org/10.1016/j.matdes.2015.09.014)

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## Evolution of Inhomogeneous Reinforced Structure in TiBw/Ti-6Al-4V Composite Prepared by Pre-sintering and Canned $\beta$ Extrusion

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### Abstract:

2.5 vol.% TiBw/Ti-6Al-4V composite with a discontinuous columnar reinforced structure was successfully fabricated by pre-sintering and subsequent canned  $\beta$  extrusion process. Detail investigation on microstructural evolution revealed that intermediate  $Ti_3B_4$  rather than TiB was substantially synthesized on surface of coarse Ti64 powders due to insufficient reaction during pre-sintering, but the growth of TiB whiskers particularly along c - axis was significantly accelerated by subsequent canned  $\beta$  extrusion, mainly resulting from the introduced high pressure and severe plastic deformation, while highly preferred orientation of TiB whiskers along extrusion direction was gradually developed. As a result, a discontinuous columnar reinforced structure in TiBw/Ti64 composite was achieved and led to superior mechanical properties of ~1450 MPa in ultimate tensile strength and ~8.2 % in fracture elongation at ambient temperature for the as-extruded composite.

*Keywords:* Titanium matrix composites; TiB whisker; Microstructure; Hot extrusion; Inhomogeneous reinforced structure; Mechanical property.

### 1 Introduction

In situ discontinuously reinforced titanium matrix composites (DRTMCs) have been sought after for many years and are considered the most promising structural materials for aviation, aerospace and lightweight automotive industries, attributing to their high specific strength and modulus, high temperature and corrosion resistance properties [1–5]. TiB has been proved to be one of the most appropriate reinforcements for titanium and titanium alloy because of its high elastic modulus and the clean bonding interface, similar thermal expansion coefficient with the

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