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PII: S1005-0302(17)30185-8
DOI: http://dx.doi.org/doi:10.1016/j.jmst.2017.07.008
Reference: JMST 1025

To appear in:

Received date: 4-4-2017
Revised date: 1-6-2017
Accepted date: 19-6-2017

Please cite this article as: D.Li, Z.W.Zhu, A.M.Wang, H.M.Fu, H.Li, H.W.Zhang, H.F.Zhang, New ductile laminate structure of Ti-alloy/Ti-based metallic glass composite with high specific strength (2010), http://dx.doi.org/10.1016/j.jmst.2017.07.008

New ductile laminate structure of Ti-alloy/Ti-based metallic glass composite with high specific strength

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[Received 4 April 2017; Received in revised form 1 June 2017; Accpted 19 June 2017]

Abstract Bulk laminate structure of Ti-alloy/Ti-based metallic glass composite (MGC) was prepared by melting a preform of alternate stack-up foils in the high vacuum atmosphere. The composite demonstrates a good combination of yield strength (~1618 MPa), plasticity (~4.3%) and specific fracture strength (384×10^3 N m kg^{-1}) in compression. The maintained yield strength results from the unique microstructure composed of the Ti layer, the solution layer with gradient structure and the MGC layer. Such a multilayer structure effectively inhibits the propagation of shear band, leading to the enhanced plasticity. Those extraordinary properities suggest that combining ductile lamella with brittle metallic glass (MG) by such a lay-up method can be an effective way to improve mechanical properties of MG.

Keywords: Laminate composite; Metallic glass; Specific strength; Plasticity