Accepted Manuscript

Title: Microstructure and tensile properties of TiC_p/Ti6Al4V titanium matrix composites manufactured by laser melting deposition

Authors: Jiandong Wang, Liqun Li, Caiwang Tan, Han Liu, Panpan Lin

PII: S0924-0136(17)30456-9
DOI: https://doi.org/10.1016/j.jmatprotec.2017.10.005
Reference: PROTEC 15425

To appear in: *Journal of Materials Processing Technology*

Received date: 13-5-2017
Revised date: 28-9-2017
Accepted date: 1-10-2017

Please cite this article as: Wang, Jiandong, Li, Liqun, Tan, Caiwang, Liu, Han, Lin, Panpan, Microstructure and tensile properties of TiCp/Ti6Al4V titanium matrix composites manufactured by laser melting deposition.Journal of Materials Processing Technology https://doi.org/10.1016/j.jmatprotec.2017.10.005

Microstructure and tensile properties of TiC_p/Ti6Al4V titanium matrix composites manufactured by laser melting deposition

Jiandong Wang[a], Liqun Li[a,*], Caiwang Tan[a,b], Han Liu[a], Panpan Lin[a]

[a] State Key Laboratory of Advanced Welding and Joining, Harbin Institute of Technology, 92 West Dazhi Street, Harbin, 150001, P.R.China

[b] Shandong Provincial Key Laboratory of Special Welding Technology, Harbin Institute of Technology at Weihai, Weihai, 264209, China

*Corresponding author: Tel./Fax: +86 451 86415506, E-mail address: liliqun@hit.edu.cn (Liqun Li)

Abstract

Laser melting deposition (LMD) technique was used to manufacture TiC particle (TiC_p) reinforced Ti6Al4V (TiC_p/Ti6Al4V) titanium matrix composites with TiC volume fraction ranging from 5% to 30%. The microstructure and tensile properties of as-deposited and heat-treated TiC_p/Ti6Al4V composites were studied. Microstructure and tensile properties of TiC_p/Ti6Al4V varied as the TiC volume fraction changing. The (i) microstructural evolution of TiC_p/Ti6Al4V under different TiC volume fraction and (ii) the effect of heat treatment on modifying microstructure and properties of the composites were researched. Moreover, the strengthening mechanism and fracture mechanism of the composites were discussed. The results showed that composites were composed of α Ti, β Ti, and TiC. The undissolved TiC particles were observed in all the composites. The strip-like eutectic TiC phases were observed in the composites when the volume fraction of TiC was 5%, while many dendritic primary TiC phases existed in the composites when the volume fraction of TiC exceeded 10%. When the heat treatment was held at 950℃ for 10 hours, the basketweave microstructure and partly dissolved off strip-like eutectic TiC phases existed in the composites with 5 vol.% TiC. The strength of the TiC_p/Ti6Al4V with 5% TiC volume fraction was improved by nearly 12.3% compared with that of the Ti6Al4V matrix alloys. Compared with that of the as-deposited composites, the ultimate tensile strength of TiC_p/Ti6Al4V composites