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Authors: Xianglong Sun, Yuanfei Han, Sanchen Cao, Peikun Qiu, Weijie Lu



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Rapid in-situ reaction synthesis of novel TiC and carbon nanotubes reinforced titanium matrix composites

Xianglong Sun, Yuanfei Han^{*}, Sanchen Cao, Peikun Qiu, Weijie Lu^{*}

State Key Laboratory of Metal Matrix Composites, Shanghai Jiao Tong University, Shanghai 200240, China

^{*} Corresponding authors. Tel.: +86 21 34202641; Fax: +86 21 34202749.

E-mail addresses: hyuf1@hotmail.com (Yuanfei Han); luweijie@sjtu.edu.cn (Weijie Lu).

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In-situ TiC and remained multi-walled carbon nanotubes (MWCNTs) reinforced Ti composites were synthesized using vacuum hot-press sintering and hot rolling. The effect of weight fraction of MWCNTs on microstructural evolution and mechanical properties of the Ti composites was investigated. The results indicated that both proportion and particle size of TiC increased in proportion to MWCNTs content, which resulted in different matrix microstructure, and the grains were obviously refined after rolling deformation. The hardness tests indicated that MWCNTs addition could make the composites harden, and 18.4% improvement in hardness was obtained after hot rolling. The significant improvement in both strength and hardness could be attributed to grain refinement, solid solution strengthening of carbon and dispersion strengthening of TiC particles and remained MWCNTs. A good combination of strength and ductility were achieved in Ti-1 wt% MWCNTs composites, which were in accordance with the uniform distribution of smaller-sized TiC particles in Ti matrix.

Keywords: Titanium matrix composites; CNTs; Powder metallurgy; Hot-rolling

1. Introduction

Titanium matrix composites (TMCs) have potential application in aerospace, advanced weapon

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