Accepted Manuscript

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PII: S1359-8368(17)34341-X

DOI: 10.1016/j.compositesb.2018.02.023

Reference: JCOMB 5548

To appear in: *Composites Part B*

Received Date: 15 December 2017

Revised Date: 14 January 2018

Accepted Date: 22 February 2018

Please cite this article as: Popov VA, Burghammer M, Rosenthal M, Kotov A, In situ synthesis of TiC nano-reinforcements in aluminum matrix composites during mechanical alloying, *Composites Part B* (2018), doi: 10.1016/j.compositesb.2018.02.023.

In situ synthesis of TiC nano-reinforcements in aluminum matrix composites during mechanical alloying

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Abstract

In this paper the possibility of fabrication of titanium carbide reinforcing nanoparticles inside an aluminum matrix by in situ synthesis during mechanical alloying will be discussed. The application of nanodiamond particles as carbon precursor for synthesis allowed obtaining TiC particles in nanosized form due to the size of initial nanodiamond particle of 4-6 nm. The developed composites were investigated by scanning electron microscopy, X-ray diffractometry, and differential scanning calorimetry.

Keywords: A: Metal-matrix composites (MMCs); Particle-reinforcement; B: Microstructures; D: Electron microscopy

1. Introduction

The advancement of science and technology requires the development of new materials. On the one hand, modernized materials enhance the quality of various products and increase their service life, while on the other hand they create new technical solutions that are fundamentally different when compared to existing ones. Metal matrix composites [1-18] provide a new level of properties unattainable in conventional non-reinforced metals and alloys. However, composites with powder-like reinforcing particles still deserve considerable attention. Multiple studies have been dedicated recently to the development of nanocomposites. e.g., composites with nano-sized reinforcing particles. However, nano-powders in this application display a number of features,