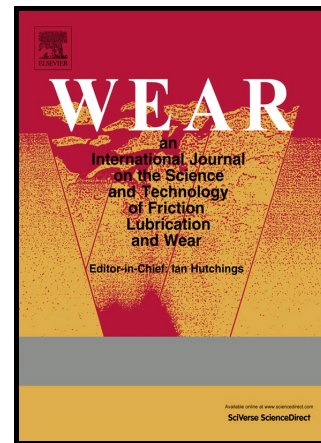


Author's Accepted Manuscript

Reinforcement Size Effects on the Abrasive Wear of Boron Carbide Reinforced Aluminum Composites

Andy Nieto, Hanry Yang, Lin Jiang, Julie M. Schoenung



www.elsevier.com/locate/wear

PII: S0043-1648(17)30516-1
DOI: <http://dx.doi.org/10.1016/j.wear.2017.08.002>
Reference: WEA102222

To appear in: *Wear*

Received date: 23 March 2017
Revised date: 2 August 2017
Accepted date: 5 August 2017

Cite this article as: Andy Nieto, Hanry Yang, Lin Jiang and Julie M. Schoenung, Reinforcement Size Effects on the Abrasive Wear of Boron Carbide Reinforced Aluminum Composites, *Wear*, <http://dx.doi.org/10.1016/j.wear.2017.08.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Reinforcement Size Effects on the Abrasive Wear of Boron Carbide Reinforced Aluminum Composites

Andy Nieto^a, Hanry Yang^{a,b}, Lin Jiang^c, Julie M. Schoenung^{a,c*}

^aDepartment of Chemical Engineering and Materials Science, University of California
Davis, Davis, CA, 95616, USA

^bSchool of Mechanical and Materials Engineering, Washington State University, Pullman,
WA, 99164, USA

^cDepartment of Chemical Engineering and Materials Science, University of California
Irvine, Irvine, CA, 92697, USA

*Corresponding author: Phone: 949-824-2575. Email: Julie.Schoenung@UCI.edu

Abstract

The use of ceramic nanoparticle reinforcements has shown significant promise for enhancing the mechanical properties of metal matrix composites due to the high specific surface area and superior intrinsic mechanical properties of nanoparticles. In this study, the effect of B₄C reinforcement particle size on the abrasive wear behavior of Al-B₄C composites was investigated. Composites with a homogenous dispersion of micrometric-B₄C, submicron-B₄C, and nano-B₄C in a nanostructured Al alloy 5083 (AA5083) matrix were fabricated using cryogenic mechanical alloying and dual mode dynamic forging. Hardness was seen to increase with decreasing B₄C reinforcement size, with the Al-nanoB₄C composite exhibiting a 56% enhancement over unreinforced AA5083. The abrasive wear resistance of the Al-nanoB₄C composite was 7% higher than the unreinforced AA5083. The other Al-B₄C composites exhibited equivalent or reduced abrasive wear resistance as compared to AA5083. Analysis of the abrasive wear scars demonstrated that larger B₄C reinforcements are prone to particle pull-out, thereby negating the benefit of higher hardness. The Al-nanoB₄C composite has superior wear resistance due its high hardness and greater interfacial area, which hindered pull-out of nano-B₄C particles.

Download English Version:

<https://daneshyari.com/en/article/4986387>

Download Persian Version:

<https://daneshyari.com/article/4986387>

[Daneshyari.com](https://daneshyari.com)