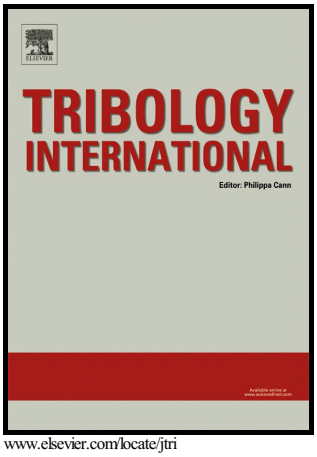
# Wear mechanisms maps of CNT reinforced Al6061 nanocomposites treated by cryomilling and mechanical milling

Mahdi Omidi, Alireza Khodabandeh, Saeid Nategh, Mehrdad Khakbiz




www.elsevier.com/locate/jtri

PII: S0301-679X(17)30041-5
DOI: http://dx.doi.org/10.1016/j.triboint.2017.01.033
Reference: JTRI4573

To appear in: *Tribiology International*

Received date: 26 October 2016
Revised date: 18 January 2017
Accepted date: 25 January 2017

Cite this article as: Mahdi Omidi, Alireza Khodabandeh, Saeid Nategh and Mehrdad Khakbiz, Wear mechanisms maps of CNT reinforced Al6061 nanocomposites treated by cryomilling and mechanical milling, *Tribiology International,* http://dx.doi.org/10.1016/j.triboint.2017.01.033

# Wear mechanisms maps of CNT reinforced Al6061 nanocomposites treated by cryomilling and mechanical milling

**Mahdi Omidi[1], Alireza Khodabandeh[1*], Saeid Nategh[1], Mehrdad Khakbiz[2]**

[a]Faculty of Materials Engineering, Science and Research Branch, Islamic Azad University, Hesarakblvd., Sattari Highway, Tehran, Iran, postal code: 1477893855, P.O. Box: 14515/775, 14155/4933

[b]Faculty of New Sciences and Technologies, University of Tehran, Post Code: 1439957131, Tehran, Iran

[*]Corresponding author. a.khodabandeh@srbiau.ac.ir

**Abstract**

In this study, wear mechanisms of Al6061-CNT nanocomposites produced by cryomilling and mechanical milling, cold compacting and extrusion have been studied.The wear maps showed that the maximum amount of abrasive wear region in all milling times,was observed for the cryomilling samples. Also these maps show that the abrasive wear region for the cryomilling and mechanical milling was maximized at 12 hrs milling time. For cryomilled samples with 8 hrs milling time or more, the weight loss decreases with increasing sliding speed at normal loads of 5 and 10N, also abrasive wear mechanism was observed at above conditions. Cryomilled samples show increased resistance against delamination and crack initiation during wear test.

**Keywords**

CNT-reinforced Al6061nanocomposite; Cryomilling; Wear mechanisms maps



## 1. Introduction

Wear mechanism map provides various information about wear mechanisms for different combinations of sliding speeds and normal loads. By using the wear maps, achieved through analysis of wear rate and worn surface morphology, transfer between different wear regions can be identified [1-6]. These maps have been prepared for a group of compounds including steel-on-steel, steel on steel nitride, ceramics wear, Al alloys, Al-matrix composites, and TiC-coated 303 stainless steels [3]. The need for the improvement of wear and mechanical properties of aluminum and its alloys leads to the development of