

# Enhancement of the Wear Resistance and Microhardness of Aluminum Alloy by Nd:YAG Laser Treatment

Haitham T. Hussein,<sup>1</sup> Abdulhadi Kadhim,<sup>2</sup> Ahmed A. Al-Amiery,<sup>1,3</sup> Abdul Amir H. Kadhum,<sup>3</sup> and Abu Bakar Mohamad<sup>3</sup>

<sup>1</sup>Applied Science Department, University of Technology, Baghdad 10066, Iraq

<sup>2</sup>Laser and Optoelectronic Engineering Department, University of Technology, Baghdad 10066, Iraq

<sup>3</sup>Department of Chemical and Process Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

Received 26 April 2014; Revised 29 June 2014; Accepted 1 July 2014; Published 17 July 2014

Academic Editor: Bojan Podgornik

Copyright © 2014 Haitham T. Hussein et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Abstract

Influence of laser treatment on mechanical properties, wear resistance, and Vickers hardness of aluminum alloy was studied. The specimens were treated by using Nd:YAG laser of energy 780 mJ, wavelength 512 nm, and duration time 8 ns. The wear behavior of the specimens was studied for all specimens before and after treatment by Nd:YAG laser and the dry wear experiments were carried out by using pin-on-disc technique. The specimens were machined as a disk with diameter of 25 mm and circular groove in depth of 3 mm. All specimens were conducted by scanning electron microscopy (SEM), energy-dispersive X-ray fluorescence analysis (EDS), optical microscopy, and Vickers hardness. The results showed that the dry wear rate was decreased after laser hardening and increased Vickers hardness values by ratio of 2.4 : 1. The results showed that the values of wear rate for samples having circular grooves are less than samples without grooves after laser treatment.