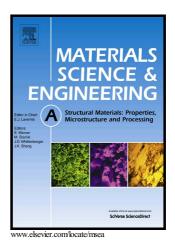
Author's Accepted Manuscript

Evolution of microstructure and grain refinement mechanism of pure nickel induced by laser shock peening

Lan Chen, Xudong Ren, Wangfan Zhou, Zhaopeng Tong, Samuel Adu-Gyamfi, Yunxia Ye, Yunpeng Ren



PII:S0921-5093(18)30625-7DOI:https://doi.org/10.1016/j.msea.2018.04.105Reference:MSA36425

To appear in: Materials Science & Engineering A

Received date: 7 April 2018 Revised date: 24 April 2018 Accepted date: 25 April 2018

Cite this article as: Lan Chen, Xudong Ren, Wangfan Zhou, Zhaopeng Tong, Samuel Adu-Gyamfi, Yunxia Ye and Yunpeng Ren, Evolution of microstructure and grain refinement mechanism of pure nickel induced by laser shock peening, *Materials Science & Engineering A*, https://doi.org/10.1016/j.msea.2018.04.105

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.

ACCEPTED MANUSCRIPT

Evolution of microstructure and grain refinement mechanism of pure nickel induced by laser shock peening

Lan Chen, Xudong Ren^{*}, Wangfan Zhou^{*}, Zhaopeng Tong, Samuel Adu-Gyamfi, Yunxia Ye, Yunpeng Ren Department of Mechanical Engineering, Jiangsu University, Zhenjiang, 212013, PR China

*Corresponding author: Tel.: +86 511 88780352; fax: +86 511 88780352 renxd@mail.ujs.edu.cn kinskindom@163.com

Abstract: This paper investigates microstructure evolution in laser shock peened pure nickel. The microstructure of the deformed layer produced by laser shock peening (LSP) was systematically characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), electron backscatter diffraction (EBSD) and transmission electron microscopy (TEM). Results indicated that the amplitude and depth of micro-hardness in the surface layer increased with the number of laser impacts. A nanocrystalline layer was prepared in pure Ni after LSP and the LSP induced microstructures included dislocations (Ds), ultra-fine laminates (UFLs), ultra-fine grains (UFGs), nano-laminates (NLs), and nano-grains (NGs). Based on the in-depth microstructure observations, a grain refinement mechanism induced by LSP in pure Ni was proposed. The strengthening mechanism of micro-hardness induced by LSP could be attributed to the barriers of dislocation motion, including low-angle grain boundaries, large-angle grain boundaries and dislocation multiplication.

Key words: Laser shock peening; Surface; Plastic deformation; Microstructure; Nanocrystalline

1. Introduction

As an effective method of producing bulk nanocrystalline materials, severe plastic deformation (SPD) has received enormous interests over the past decades [1,2]. SPD imposes intense plastic strain into metallic materials, while it maintains the overall dimensions of the work-piece. SPD processing can lead to a significant grain refinement in pure metals and metallic alloys. Furthermore, the refined grains, which are typically in sub-micrometer or nanometer range,

Download English Version:

https://daneshyari.com/en/article/7972002

Download Persian Version:

https://daneshyari.com/article/7972002

Daneshyari.com