## Author's Accepted Manuscript

Heterogeneous structure controlled by shear bands in partially recrystallized nano-laminated copper

Yao Jiang, Rui Cong Gu, Yong Zhang, Jing Tao Wang



PII:S0921-5093(18)30317-4DOI:https://doi.org/10.1016/j.msea.2018.02.098Reference:MSA36185

To appear in: Materials Science & Engineering A

Received date: 30 November 2017 Revised date: 24 February 2018 Accepted date: 26 February 2018

Cite this article as: Yao Jiang, Rui Cong Gu, Yong Zhang and Jing Tao Wang, Heterogeneous structure controlled by shear bands in partially recrystallized nano-laminated copper, *Materials Science & Engineering A*, https://doi.org/10.1016/j.msea.2018.02.098

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.

## Heterogeneous structure controlled by shear bands in partially recrystallized nano-laminated copper

Yao Jiang<sup>a</sup>, Rui Cong Gu<sup>b</sup>, Yong Zhang<sup>a</sup>, Jing Tao Wang<sup>a,b,\*,</sup>

<sup>a</sup> Herbert Gleiter Institute of Nanoscience, Nanjing University of Science and Technology, Nanjing, No. 200, Xiaolingwei 210094, China

<sup>b</sup> School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, No. 200, Xiaolingwei 210094, China

E-mail: \*jtwang@njust.edu.cn

## Abstract

The recrystallization behavior of ultra-fine grained (UFG) copper and nano-laminated (NL) copper, prepared by equal channel angular pressing (ECAP) and ECAP with subsequent cryogenic rolling (CYR), was investigated. According to the course of isothermal annealing, the significant effect of inhomogeneous deformation on the subsequent recrystallization was confirmed. In uniform UFG copper, the recrystallized grains are equiaxed and distributed randomly. In contrast, in non-uniform NL copper with dense shear bands (SBs), as introduced by CYR, recrystallized grains are severely clustered and exhibit abnormal growth related to the preferential recrystallization behavior of the SBs. The overall recrystallization kinetics curve shows that NL copper has a much lower Avrami exponent than UFG copper, which is explained using the modified two-stage kinetics Johnson-Mehl-Avrami-Kolmogorov model incorporating the non-uniform microstructure. The recrystallized microstructures originating from the SBs are found to be not limited to within the SBs regions because the following abnormal growth was at the consume of the deformed NL matrix. Furthermore, the abnormal growth rate of the recrystallized SBs was controlled by the stored energy in the NL matrix. A Vickers microhardness test indicated that the strength-ductility tradeoff may be overcome by exploiting the two-stage recrystallization behavior to control heterogeneous microstructures in Download English Version:

## https://daneshyari.com/en/article/7972909

Download Persian Version:

https://daneshyari.com/article/7972909

Daneshyari.com