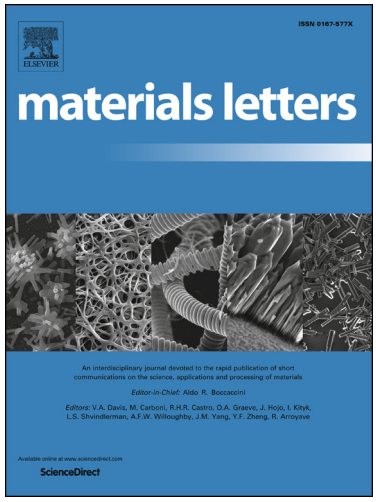

Origin and evolution of a fivefold twin on the surface of a nickel alloy

Siling Huang, Zhenyu Zhang, Chao Xu, Zhanwei Zhu, Junfeng Cui, Bo Wang

PII: S0167-577X(18)31012-7
DOI: https://doi.org/10.1016/j.matlet.2018.06.106
Reference: MLBLUE 24546

To appear in: *Materials Letters*

Received Date: 26 February 2018
Revised Date: 3 June 2018
Accepted Date: 24 June 2018

Please cite this article as: S. Huang, Z. Zhang, C. Xu, Z. Zhu, J. Cui, B. Wang, Origin and evolution of a fivefold twin on the surface of a nickel alloy, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.06.106

Origin and evolution of a fivefold twin on the surface of a nickel alloy

Siling Huang, Zhenyu Zhang*, Chao Xu, Zhanwei Zhu, Junfeng Cui, Bo Wang

Key Laboratory for Precision and Non-Traditional Machining Technology of Ministry of Education, Dalian University of Technology, Dalian 116024, China

Abstract: At present, one thinks that fivefold twins (FTs) are formed from the multiple partial dislocations emitted from the grain boundaries. This results in that there are no reports on the deformation twinning of FTs from a single crystal. In this study, deformation twinning of an FT is performed from a single crystal, which is induced on the surface of an alloy under nanoindentation. The origin and evolution of an FT is elucidated on the surface of a nickel alloy. Incoherent twin boundaries (ITBs) play the most important role during the formation of an FT.

Keywords: Crystal structure; Microstructure; Surfaces; Evolution; Fivefold twin; Ni alloy

* Corresponding author.

E-mail address: zzy@dlut.edu.cn (Z. Zhang).

1. Introduction

Refining and twinning are two effective ways to improve the mechanical properties of materials [1]. Nevertheless, Refining of grains suffers from the dramatic decrease of ductility, limiting its pragmatic applications in engineering [2]. In comparison, twinning of grains increases tensile strength of copper (Cu) ten times that of coarse grained counterparts, maintaining the ductility [3]. Therefore, twinning is a promising means to increase mechanical properties of materials. Fivefold twin (FT) reveals a significant increase in the Young's modulus, originating from the central area of a FT [4]. The maximum yield strength of fivefold nanotwinned (nt) Ag NW is 2.64 GPa, which is about 50 times that of bulk materials, close to the theoretical value of