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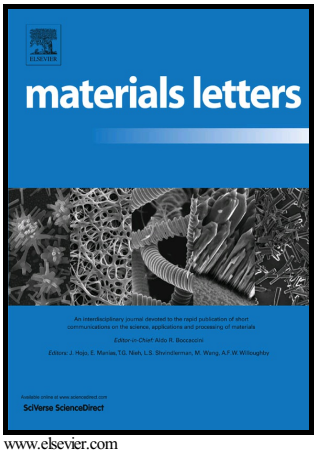

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PII: S0167-577X(16)31093-X
DOI: http://dx.doi.org/10.1016/j.matlet.2016.06.127
Reference: MLBLUE21128

To appear in: *Materials Letters*

Received date: 17 May 2016
Revised date: 29 June 2016
Accepted date: 30 June 2016

Cite this article as: I.S. Nikulin, N.V. Kamyshanchenko, T.B. Nikulicheva, M.V. Mishunin and K.A. Vokhmyanina, Formation of low-angle boundaries accompanying the deformation process by twinning in titanium, *Material Letters,* http://dx.doi.org/10.1016/j.matlet.2016.06.127

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Formation of low-angle boundaries accompanying the deformation process by twinning in titanium

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Abstract

The structure of the transition zone of the wedge twin formed inside the grains of polycrystalline titanium was experimentally investigated. The accumulation of low-angle grain boundaries formed during the deformation by twin growing was discovered. Mathematical modeling of the stress state close to the twin zone was described in context of the macroscopic dislocation model. The model allows describing physical processes responsible for the formation of low-angle grain boundaries in a form of dislocation walls close to the transition zone of the wedge twin.

Keywords:

Twinning, titanium, defects, dislocation walls, grain boundaries, stress, mathematical modeling

Accepted manuscript

1.Introduction

Mechanical twinning in real polycrystalline materials is a complex multistage process of movement and interaction of dislocations. On the one hand, the stress concentration at the boundaries of structural fragments and areas of intersections of twinning layers can lead to brittle fracture, and on the other hand, the presence of twinning layers significantly increases the durability of metals [1]. The direct result of the

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