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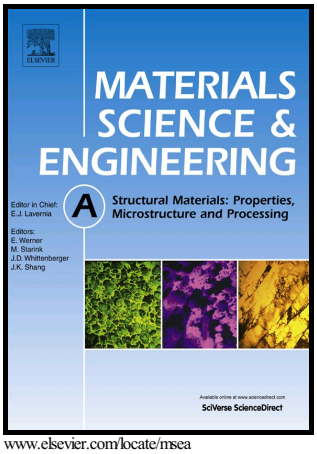

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Localized deformation via multiple twinning in a Mg-Gd-Y-Zr alloy processed by high-pressure torsion

Lingling Tang[1], Yonghao Zhao[1*], Ningning Liang[1], R. K. Islamgaliev[2], R. Z. Valiev[2,3], and Y. T. Zhu[1,4]

[1]Nano Structural Materials Center, School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing 210094, China

[2]Institute of Physics of Advanced Materials, Ufa State Aviation Technical University, 12K. Marx St., Ufa, Russia

[3]Laboratory for Mechanics of Bulk Nanomaterials, Saint Petersburg State University, 28 Universitetsky prospekt, Peterhof, Saint Petersburg, 198504, Russia

[4]Department of Materials Science and Engineering, North Carolina State University, Raleigh, NC 27695, USA

[*]Corresponding author. yhzhao@njust.edu.cn

Abstract

Different with common grain refinement dominated by dislocation activities, grain subdivision induced by sequential activation of multiple twinning was observed in a Mg-Gd-Y-Zr magnesium alloy via high-pressure torsion. Deformation bands were evolved from large primary twin bands, which contained refined grains through localized multiple twinning. Nanometer-scaled amorphous bands were also observed within deformation bands in Mg alloys for the first time. These observations indicate that localized deformation via multiple twinning and the consequent formation of deformation bands are potential routes to grain refinement in rare earth-magnesium alloys.

Keywords: Magnesium; alloying; deformation twinning; grain refinement; deformation bands

1. Introduction

Deformation twinning plays an important role in the plastic deformation of Mg alloys at room temperature, due to their limited number of dislocation slip systems in