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Intensifying Goss/Brass texture ratio in AA2024 by asymmetric cold rolling

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Abstract

The effect of asymmetric cold rolling on the crystallographic texture of the AA2024 aluminum alloy was investigated. The texture after asymmetric cold rolling consisted of the strong Goss {011}<100>, Goss-Brass {011}<115>, Brass {011}<211>, and Rotated Goss {011}<011> components (i.e. a strong α -fiber <011>||ND). It was found that asymmetric cold rolling present great differences in texture evolution relative to conventional cold rolling. The results showed that the asymmetric cold rolling of AA2024 at 20% and 40% thickness reductions led to increasing the Goss/Brass texture ratio to 1.44 and 1.32, respectively.

Keywords: *Metals and alloys; Texture; Deformation*

1. Introduction

During almost 60 years, Al-Cu-Mg (2xxx) alloys have attracted much attention in military, airspace, and transportation industries. The main reason for this success is a combination of high specific strength and high fatigue resistance at ambient and elevated temperatures [1–5]. In order to further improve the fatigue resistance of Al-Cu-Mg aluminum alloys, many efforts have been made to reveal the microstructure and crystallographic texture effect on fatigue crack propagation [3–9]. It is well-accepted that the finer grain size was not always consistent with the higher fatigue resistance [4,10,11]. In fact, the formation of some texture components such as Goss orientation {011}<100> during grain refinement leads to improvement of fatigue resistance [3–9].

Recently, researchers paid efforts to clarify the effect of crystallographic texture on fatigue resistance. In 2016, Zhao et al. [7] found that the Goss grains in the Al-Cu-Mg alloy, presented a significant fatigue performance, but the Brass grains exhibited a small resistance to fatigue crack propagation. They reported that the high Goss/Brass volume fraction ratio was responsible for the enhanced fracture toughness in the Al-Cu-Mg alloy. In 2017, Li et al. [4] proposed a new way to improve fatigue performance of this alloy mainly includes two steps: intensifying Goss texture component by hot

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