Neutron diffraction study of texture and stress evolution in magnesium AZ31 during cycle loading

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Abstract

A hot-rolled AZ31 magnesium alloy exhibiting fibre texture with strong (0001) basal component was studied. The experimental study were carried on TKSN 400 (HK9) diffractometer in the NPI in Řež (Czech Republic) using angular dispersion method. The in-situ diffraction measurement during compression followed by tension load applied in rolling direction allowed to obtain evolution of texture (from diffraction peak intensity) and grain stress for the preferred grain orientations. The evolution of peak intensity for different hkl reflections were combined with orientation distribution function determined before- and after-cycle test. As the result, the observed variation in volume fraction of grains having selected orientations allowed to describe twinning and detwinning effects. On the basis of measured lattice strains combined with changes in crystallographic texture, the CRSS value for the first order tensile twinning was determined. The obtained values are in good agreement with the values previously found using ToF (time of flight) diffraction (1,2). The most important result is the description of the detwinning process and measured value of CRSS for this process.
1. P. Kot, M. Wroński, A. Baczmański, A. Ludwik, et al. *Measurement*, **221**, (2023), 113469.

2. A. Baczmański, P. Kot, S. Wroński, M. Wróbel, et al., *Materials Science & Engineering A*, **801**, (2021), 140400

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Keywords: stress localization, lattice strains evolution, volume fraction evolution, twinning, detwinning, magnesium AZ31

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