Accepted Manuscript

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PII:	S1044-5803(17)32856-5
DOI:	doi:10.1016/j.matchar.2018.03.016
Reference:	MTL 9105
To appear in:	*Materials Characterization*
Received date:	17 October 2017
Revised date:	11 March 2018
Accepted date:	11 March 2018

Please cite this article as: Z.J. Wang, M. Ma, Z.X. Qiu, J.X. Zhang, W.C. Liu , Microstructure, texture and mechanical properties of AA 1060 aluminum alloy processed by cryogenic accumulative roll bonding. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Mtl(2017), doi:10.1016/j.matchar.2018.03.016

Microstructure, texture and mechanical properties of AA 1060 aluminum alloy processed by cryogenic accumulative roll bonding

Z.J. Wang, M. Ma, Z.X. Qiu, J.X. Zhang, W.C. Liu*

Key Laboratory of Metastable Materials Science and Technology, College of Materials Science and Engineering, Yanshan University, Qinhuangdao 066004, P.R. China

Abstract

AA 1060 aluminum alloy sheet was processed to five accumulative roll bonding (ARB) cycles at cryogenic temperature. The microstructure, texture and mechanical properties of the ARB processed sheets were investigated. The results show that the surface layer of the ARB processed sheets exhibits a significant r-cube shear texture. Initial cube orientation at the surface layer was gradually rotated to the r-cube orientation during the ARB process, leading to the increase in the strength of the r-cube shear texture with ARB cycles. The texture evolution at the surface layer was quantified in terms of a simple relation between the texture volume fractions and accumulated true strain. The strength of the β fiber rolling texture and the distribution of orientation intensities along the β fiber at the center layer were strongly affected by the initial texture. As the ARB cycles increased, the initial texture was changed from the cube texture to the r-cube texture, leading to a continuous increase in the strength of the β fiber rolling texture dominated by the C orientation. The yield and ultimate tensile strength of the ARB processed sheets increased markedly after the first ARB cycle and then increased slowly with increasing ARB cycles, while the elongation decreased accordingly.

* Corresponding author: Tel.: +86 335 8074795; Fax: +86 335 8074545.

E-mail address: wcliu@ysu.edu.cn (W.C. Liu)