

Heterogeneous Structures by Linear Corrugated Pressing

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Linear corrugated pressing (LCP) is a method by which severe plastic shear deformation is imposed in a defined pattern over sheet and thin plate materials. Microstructural heterostructures can be created to meet specific design requirements with interlaced coarse- and fine-grained regions. The process involves deforming a plate by shear in a confined region of the specimen, and repeating this process at intervals that are designated by the process engineer [1]. Electron backscatter diffraction (EBSD) analysis shows that heterogeneous microstructures in plate material can easily be created with alternate regions of large grain and small grain structures as well as locally differing crystallographic textures. Both of these features result in improved or retained elongation and increased strength. LCP processing was performed on a 4 mm thick twin roll cast AZ31 Mg alloy plate and the structures were characterized using EBSD (Fig. 1). Finite element-based modeling is shown to be useful in designing the process for the desired microstructure.

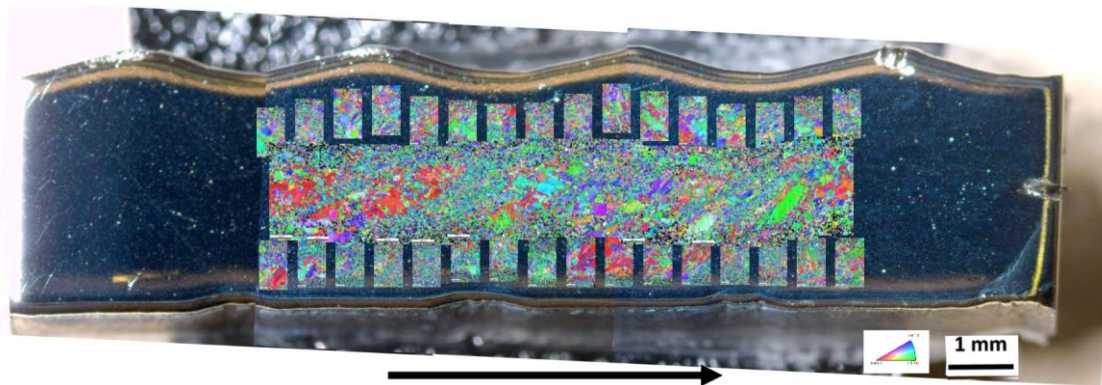


Fig.1: Orientation image superposed on an image of an LCP-processed AZ31 plate. Colors indicate poles aligned normal to the specimen surface direction. The arrow shows the direction of LCS processing.

Keywords: Severe plastic deformation, electron backscatter diffraction, magnesium alloy, heterogeneous microstructure

References:

[1] JP Young, The Production of Fine-Grained Magnesium Alloys through Thermomechanical Processing, Ph.D. Dissertation, Washington State Univ, 2015.