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Twinning Contributions to Strain Localizations in Magnesium Alloys

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Abstract

The effect that twin activity in Magnesium alloys has in both local and global strain is investigated in this article. The need to investigate this effect is related to difficulties in relating the spatially varying twinning with both plasticity and failure aspects of this particular class of alloys. To address this need, mechanical testing both inside and outside the Scanning Electron Microscope was conducted and it was coupled with Digital Image Correlation (DIC) deformation and Electron Backscattered Diffraction (EBSD) texture measurements. In addition volume recordings of Acoustic Emission (AE) and surface measurements of microstructural changes were used to further complement the in situ tracking of twinning activity throughout monotonic and cyclic mechanical loading experiments. The definition of appropriate monitoring regions allowed the direct correlation of evolving twin activity with associated deformation in Magnesium alloys, for the first time to the authors' best knowledge, from which twinning contributions to strain localizations were computed.

Keywords: Twinning; Strain localizations; Digital Image Correlation (DIC); Electron Back Scattered Diffraction (EBSD); Mechanical Behavior

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