Effect of texture on shear banding in ECAP

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Abstract

Samples taken from a room temperature (RT) extruded aluminium alloy 6060 were deformed by equal-channel angular pressing (ECAP, one pass, RT). Texture measurements by X-ray diffraction reveal a strong predominant $< 111 >$ fibre texture in the extruded bar. Depending on the alignment of the fibre axis with respect to the ECAP die, strain localization phenomena in form of shear bands are observed. Local texture measurements by electron backscatter diffraction after ECAP reveal a clear shear texture with certain components dominating. The shear texture is related to the starting texture which determines the slip system activity. Thus, there is a clear correlation between starting texture and shear banding during ECAP. Texture simulations reproducing the experimental texture show that the Taylor factor is constantly decreasing when shear banding takes place while in the case of homogeneous shear it goes over a maximum. This clearly indicates that geometrical softening leads to the mechanical instabilities.

Keywords: Texture, Equal channel angular pressing, Shear banding

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