

Micro-Texture Effect on Fracture Location in Carbon Steel during Forming

Authors : Sarra Khelifi, Youcef Guerabli, Ahcene Boumaiza

Abstract : Advances in techniques for measuring individual crystallographic orientations have made it possible to investigate the role of local crystallography during the plastic deformation of materials. In this study, the change in crystallographic orientation distribution during deformation by deep drawing in carbon steel has been investigated in order to understand their role in propagation and arrest of crack. The results show that the change of grain orientation from initial recrystallization texture components of $\{111\}<112>$ to deformation orientation $\{111\}<110>$ incites the initiation and propagation of cracks in the region of $\{111\}<112>$ small grains. Moreover, the misorientation profile and local orientation are analyzed in detail to discuss the change from $\{111\}<112>$ to $\{111\}<110>$. The deformation of the grain with $\{111\}<110>$ orientation is discussed in terms of stops of the crack in carbon steel during drawing. The SEM-EBSD technique was used to reveal the change of orientation; XRD was performed for the characterization of the global evolution of texture for deformed samples.

Keywords : fracture, heterogeneity, misorientation profile, stored energy

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